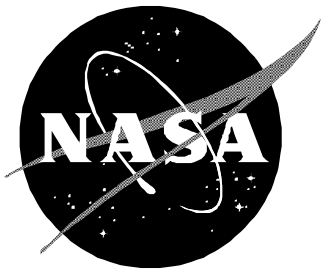

National Aeronautics
And Space Administration

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Announcement of Opportunity

Discovery Program 2004
and
Missions of Opportunity

Notice of Intent to Propose Due: **May 14, 2004**
Proposals Due: **July 16, 2004**

OMB Approval Number 2700-0085

DISCOVERY PROGRAM AND MISSIONS OF OPPORTUNITY
ANNOUNCEMENT OF OPPORTUNITY

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1.0 Description of Opportunity

1.1 Introduction

The Office of Space Science (OSS) of the National Aeronautics and Space Administration (NASA) announces the opportunity to conduct planetary science investigations through Discovery Program space flight missions that meet the goals of planetary system(s) exploration. For the purpose of this Announcement of Opportunity (AO), the terms "planetary science" and "planetary system(s) exploration" encompass the scientific objectives of the NASA Solar System Exploration (SSE) theme (excluding Mars) and the search for extrasolar planetary systems element of the NASA Astronomical Search for Origins (ASO) theme. Discovery missions, therefore, are solar system science missions intended for travel to and exploration of solar system bodies and/or for remote examination of the solar system and extrasolar planetary system environments. Additional information concerning these themes can be found in documents cited in Section 2.1, in the Discovery Program Library (DPL, listed in Appendix D), and on the OSS homepage at the World Wide Web URL address http://spacescience.nasa.gov/.

The Discovery Program is designed to accomplish frequent, high quality planetary science investigations within a cost cap. The Program seeks to contain total mission cost and to improve performance through innovative, streamlined, and efficient management, engineering, and operational approaches. This AO allows proposals for two different types of scientific investigations through the Discovery Program: 1) stand alone Discovery Mission investigations, and 2) appropriate scientific investigations through participation in space missions sponsored by organizations other than the OSS; the latter are identified in this announcement as Mission of Opportunity investigations.

- Discovery Mission investigations shall be launched on Expendable Launch Vehicles (ELVs) no later than December 31, 2009, to accomplish science investigations consistent with objectives stated in Section 2.1 of this AO. The total NASA OSS Cost through the end of the primary mission (i.e. fulfillment of the primary objectives of the mission) shall not exceed $360M in Fiscal Year (FY) 2004 dollars (see Sections 5.1 through 5.11 for a description of both general and specific restrictions). Proposals submitted in response to this AO for Discovery Mission investigations must be for complete investigations, defined as a concept study (Phase A), preliminary design (Phase B), final design and development of all flight experiment hardware, spacecraft bus, and mission operations software and equipment (Phase C), spacecraft Assembly, Test and Launch Operations (ATLO) (Phase D), mission operations and data analysis (Phase E), and, if applicable, extended mission operations (Phase F). Phase F proposals are optional; the costs need not be included under the NASA OSS Cost cap. Investigations must include analysis and publication of data in the peer reviewed scientific literature, delivery of the data to NASA's Planetary Data System (PDS) in a PDS-acceptable format, and full implementation of an Education and Public Outreach (E/PO) program related to the mission (See

Section 5.11). Proposals that describe only portions of investigations (such as the provision of an instrument as part of a non-U.S. mission) may, if appropriate, be proposed as Mission of Opportunity investigations.

- Discovery Mission of Opportunity (MO) investigations are part of non-OSS space missions of any size launched no later than December 31, 2009, and that require a commitment from NASA before December 31, 2005. MOs shall be accomplished within a cost to NASA OSS of $35M (FY 2004 dollars) and may address any of the OSS Solar System Exploration (SSE) science objectives except those of the study of Mars, for which there are separately funded opportunities. MO investigations may involve: (i) the provision of flight hardware followed by data analysis, (ii) the development of physical models and their application to both the design and interpretation of instrumental data in phases B, C/D, and E, or (iii) only the analysis of science data taken by the "parent" mission although, in general, MO investigations are not to be a substitute for a Data Analysis program that comes more appropriately after data are placed in the archive. In any event, MO investigations are generally conducted on a no-exchange-of-funds basis with the organization sponsoring the parent mission. MO investigations may be approved through the Discovery Program when their perceived value is high and their proposed cost to NASA OSS is within the above cost cap. Mission extensions of approved NASA SSE missions in Phase E nearing the end of their Prime or Extended mission phases may be proposed as MOs (see Section 5.12.3). New science investigations that would extend operation of an existing NASA space asset in operation may be proposed in accordance with Section 5.12.4. NASA also expects MO investigations to meet other Discovery program objectives to contain total mission cost and to improve performance through innovative, streamlined, and efficient management approaches, and the use of new technology engineering, and operational approaches, as well as enhancing education and the public understanding of science (see Section 5.12).

Discovery investigation teams for either full Mission investigations or for MO investigations must be led by a single Principal Investigator (PI) as described in Section 5.1.

Contributions including services from non-OSS U.S. as well as non-U.S. sources are welcome, including contributions to the payload, to the spacecraft, and/or to the launch services, subject to certain exceptions and limitations detailed in Section 5.9.3 (see also Section 5.10).

Regardless of the type of investigation offered, proposals to the Discovery Program will require careful tradeoffs between science and cost to produce investigations with the highest possible science value for the cost. Investigations proposed at or near the respective cost caps will be selected only if the science is especially compelling since NASA is seeking program balance between lower and higher cost investigations that will

allow a mission launch approximately every 18-24 months within the Discovery Program funding profile.

All missions must include adequate reserves at every phase of the mission lifecycle. All selected missions or MOs will be required to show a budget reserve posture at the end of phase B commensurate with the risk associated with the implementation of the mission, but no less than 25% of cost to go for costs through the end of Phase D, excluding the cost of the ELV. A cost reserve for Phase E must also be included as appropriate.

A major goal of all of NASA's space science programs is to enhance the public awareness of, and appreciation for, space exploration and to incorporate E/PO activities into its science investigations (see Section 5.6 of this AO). Additionally, the Discovery Program requires proposers to set goals for the participation of Small Disadvantaged Businesses (SDBs), Women-Owned Small Businesses (WOSBs), Veteran-Owned Small Businesses (VOSBs), Historically Black Colleges and Universities (HBCUs), and other Minority Educational Institutions (MEIs) in proposed procurements (see Section 5.8). Participating Scientist Programs (PSPs), Data Analysis Programs (DAPs), and/or Guest Observing Programs (GOs) that involve more members of the community in the data analysis and/or mission operation are encouraged, as described in Section 5.2.5.

Proposals for both Discovery Mission investigations and MO investigations must comply with the requirements and constraints specified in this AO (see also checklist provided in Appendix G). Proposals that are judged *not* to be in compliance will be returned to the proposers without further review.

The Discovery Program Library contains documents intended to assist proposers in the preparation of proposals (see Appendix D).

1.2 Overview of Proposal Evaluation and Selection

Investigations proposed in response to this AO will be evaluated on the basis of their scientific and technical merits and feasibility (including assessment of technical, schedule and cost risks) as evaluated by peer review (see Section 7.2 in this AO). Consistent with the Discovery Program's objective of providing frequent flight opportunities for scientific investigations, the proposed cost to NASA OSS, including its associated reserve, will be used as an important criterion at the time of selection to help discriminate between proposals of otherwise comparable merits. Additional selection factors will be the investigation's demonstrated commitment to E/PO and to participation of small business concerns, including WOSBs, HBCUs, and other MEIs. It is anticipated that approximately three meritorious Discovery Mission investigation proposals will be selected for further study as a result of this evaluation. One or more MO investigation proposals may also be selected either for study or for immediate implementation.

Each of the selected mission investigation teams will be funded to perform a Phase A Concept Study of up to 6 months at a level up to $1M in Real Year dollars (RY$), which

must be budgeted in the initial proposal. NASA may select an MO investigation for implementation without a Concept Study if it is satisfied with its readiness for development and implementation as proposed (see Section 5.12). If a Concept Study is deemed necessary for an MO investigation, funding will be determined on a case-by-case basis but will not exceed $250K (RY$). At the conclusion of the Concept Studies, NASA will conduct rigorous reviews to evaluate the detailed plans for the implementation of the selected investigations. As a result of this Phase A evaluation, one or more Discovery Mission investigations and possibly one or more MO investigations may be confirmed for phase B.

NASA is not required to make any selections under this solicitation.

1.3 NASA's Safety Priority

Safety is the freedom from those conditions that can cause death, injury, and occupational illness; damage to or loss of equipment or property; or damage to the environment. NASA's priority is to protect—

- The public;
- Astronauts and pilots:
- The NASA workforce (including contractor employees working on NASA contracts); and
- High-value equipment or property.

2.0 Science

2.1 Science Objectives

The scientific goals of planetary system(s) exploration within the OSS are detailed in NASA's *Space Science Enterprise Strategic Plan* (October 2003) and the *NASA 2003 Strategic Plan* (NPD 1001.C, February 2003), Appendix III. These goals and objectives are supported by the report of the National Research Council's Committee on Planetary and Lunar Exploration, titled *The Exploration of Near Earth Objects (1998),* the report of the National Research Council's Committee on Planetary and Lunar Exploration, titled *An Integrated Strategy for the Planetary Sciences: 1995-2010*, the *Search for Origins Roadmap* (July 1997), the Association of Universities for Research in Astronomy report *HST and Beyond, Exploration and Search for Origins: A Vision for Ultraviolet - Optical - Infrared Space Astronomy (May 1996),* and the *Roadmap for Solar System Exploration* and the *Roadmap for the Office of Space Science Origins Theme* (January 2003). All of these documents are contained in the Discovery Program Library (see Appendix D). The scientific goals in these referenced documents as they relate to the scientific objectives of the NASA Solar System Exploration theme (excluding the study of Mars) and the search for extrasolar planetary systems element of the NASA Astronomical Search for Origins theme form the basis of the science evaluation criterion.

The goals and strategies outlined in the above documents encompass a wide range of scientific questions spanning a variety of scientific disciplines that NASA seeks to address by supporting investigations in three broad categories: (1) laboratory research and theoretical analyses, (2) ground-based astronomical observations, and (3) flight projects. This Discovery Program AO solicits only those investigations that fall into the third category. Investigations proposed to be accomplished as flight projects in the Discovery Program may include, but are not limited to, remote observations from Earth-orbiting spacecraft, flyby and/or rendezvous/orbiter spacecraft, landers and/or penetrators, and sample return missions.

2.2 Ancillary Program Goals

Principal Goal: Provide frequent flight opportunities for high quality, high value scientific investigations that can be accomplished under a not to exceed cost cap.

By conducting a series of planetary science investigations, NASA will provide a mechanism by which pressing questions in planetary science may be addressed, permitting a steady improvement in our understanding of planetary systems and the processes that affect them. The frequent, steady nature of the investigations will ensure a continuing stream of fresh scientific data to the planetary science community, thus helping to maintain the excellence of the U.S. planetary science program, and to inspire the next generation of investigators. In addition, there are several ancillary goals that are considered of high intrinsic value by NASA for the science community, the U.S. aerospace industry, and the nation at large, as follows:

Ancillary Goal 1: Pursue innovative ways of doing business.

The short development schedule and cost limits associated with Discovery necessitate innovative teaming arrangements among academia, industry, and/or Government partners. Competitively selected teams will have the responsibility and authority to accomplish the entire mission investigation by utilizing innovative approaches to stay within the strict cost and schedule limits of the program, as long as fundamental principles for sound management, engineering, and safety and mission assurance (e.g. those listed in NPR 7120.5B and referenced in Section 5.3.1) are not compromised. NASA oversight and reporting requirements will be limited to those that are essential to assure the success of the science investigation in compliance with committed cost, schedule, performance, reliability, and safety requirements.

Ancillary Goal 2: Encourage the use of advanced technologies to achieve program objectives and foster their transfer into the private sector.

The inclusion of new technologies to achieve performance enhancements and to reduce total mission cost is encouraged in Discovery proposals provided that appropriate risk mitigation measures are also included. The use of new technologies will enable more aggressive and exciting scientific objectives to be pursued. The teaming of industry,

university, and Government as noted in Goal 1 above is meant to foster an environment conducive to technology development, utilization, and commercialization.

Ancillary Goal 3: Inspiring and motivating students to pursue careers in science, technology, engineering, and mathematic (STEM) by supporting education in the Nation's schools and engaging the public in shaping and sharing the experience of exploration and discovery by supporting informal education and public outreach efforts.

Contributing to the improvement of STEM education and the public understanding of science are explicit goals of the Discovery Program and NASA as a whole. The Discovery Program is committed to incorporating program elements directed toward sharing the results of our missions and research programs with wide audiences and using space science discoveries as vehicles to improve teaching and learning at all levels. We place special emphasis on precollege education, diversity, and increasing the general public's understanding and appreciation of science, technology, engineering, and mathematics.

3.0 Program Background

The Discovery Program was initiated in 1992 as a way to ensure frequent access to space for planetary science investigations. Previous Discovery Program AOs were released in 1994, 1996, 1998, and 2000. The three completed missions in the Discovery Program are NEAR, Mars Pathfinder, and Lunar Prospector. CONTOUR was lost shortly after its launch in 2002. Six other missions selected and in operation, formulation, or implementation are: Stardust, Genesis, Messenger, Deep Impact, Kepler, and Dawn. Two missions of opportunity (Aspera-3 and Netlander) were selected and funded for development. Information about all previous and current Discovery missions may be found on the World Wide Web at http://discovery.nasa.gov/missions.html.

4.0 Proposal Opportunity Period

This AO is for a singular opportunity to propose science investigations in compliance with the schedule given in Section 8 below. It is the intent of NASA OSS to release other Discovery program AOs for future opportunities approximately every 18-24 months as allowed by available and approved budgets.

5.0 Requirements and Constraints

5.1 General

In the Discovery Program, the major responsibility for the selected investigation rests with the PI who, along with the investigation's Project Manager (PM) and supporting team, will have a large degree of freedom to accomplish its proposed objectives provided

that there is a demonstrated commitment to fundamental principles for sound management, engineering and safety, and mission assurance (see NPR 7120.5B and Section 5.3.1). Once an investigation has been selected for phase B, failure to maintain reasonable progress on the agreed upon schedule or failure to operate within the constraints outlined in this section may be cause for its termination by NASA.

Therefore, proposed investigations must be designed with an end to end system view, and the scope must be consistent with the requested resources. Cost reserves, schedule reserves, and technical design margins must be consistent with a low to moderate risk posture to increase the probability of mission success.

Only those investigations for which the proposed cost, design/development schedule, and launch vehicle requirements are within the constraints and guidelines identified herein will be considered as candidates for selection.

Discovery investigation teams for either full mission investigations or for MO investigations must be led by a single PI who may come from any category of U.S. or non-U.S. organizations, including educational institutions, industry, nonprofit institutions, NASA Field Centers, the Jet Propulsion Laboratory (JPL) and other Federally Funded Research and Development Centers (FFRDCs), and other Government agencies.

Teaming arrangements among universities, industry, nonprofit institutions, NASA field centers, JPL and other FFRDCs, and/or Government agencies (both foreign and domestic) are encouraged. Teams are encouraged to utilize industry participation to the fullest extent reasonable.

For investigations selected through this AO for Phase A Concept Studies, specific guidance relative to Concept Study preparation is contained in a document entitled *Guidelines and Criteria for the Phase A Concept Study*, located in the DPL.

5.2 Science

5.2.1 Scope of Proposed Investigations

The Discovery Program is intended to perform focused planetary science investigations (excluding the study of Mars) that conclude with published articles in the peer-reviewed archival literature, as well as deposition of appropriately reduced and calibrated data in designated data archives. The relationship between the scientific objectives, the data to be returned, and the instrument payload to be used in obtaining the desired data must be unambiguous and clearly stated. Discovery investigation teams will be responsible for initial analysis of the data, subsequent delivery of the data to the PDS, the publication of scientific findings, implementation of educational programs, and communication of results to the public. Information on the PDS, its formats, and its requirements are included in the DPL.

Options for extended missions (Phase F), if applicable, must be included in proposals to this AO. Costs for such options need not be included in the proposal but will not count against the NASA OSS Cost cap (Section 5.9.1). However, selected proposers must understand that inclusion of such options in the original proposal does not imply a commitment from NASA to select them (see Section II of Appendix A of this AO for a statement concerning partial selections).

5.2.2 Protocols and Policies for Handling Returned Samples

All samples of extraterrestrial planetary materials returned by Discovery missions are NASA property (see NASA Procedural Requirement NPR 7100.10D in the proposal library) and must be delivered to and processed by the NASA Astromaterials Curatorial Facility located at NASA's Johnson Space Center (JSC); contact Dr. Carlton Allen, Astromaterials Curator, telephone (281) 483-5126, (Email carlton.c.allen@nasa.gov). This facility is responsible for the physical security, inventory accountability, environmental preservation, and distribution of the samples in support of scientific research programs organized around each mission, including sample processing in support of the mission science team. Funding for use of the JSC Curatorial Facility, including all required laboratory construction or modification, must be included in the budget for the proposed mission. The actual costs for all aspects of curation will be borne by the mission at least two years prior to and two years following spacecraft return. Samples to be used by the science team shall be allocated under procedures similar to those currently in use for other astromaterials collections, but expedited to allow early science return from the mission team. Mission proposals are expected to budget for the preliminary examination of the samples and should describe how samples will be processed during the early science/preliminary examination period. The goal should be to provide, within six months of sample return, a catalog containing sufficient information to allow the community at large to propose research with the samples. On request, the Astromaterials Curator will provide a curatorial representative to assist the PI in planning for sample handling, and PIs are encouraged to include the curatorial representative as a full member of the mission science team.

As a proportionate return for investment by foreign participants in a mission that returns extraterrestrial materials, a fraction of the total returned sample may be forwarded to the national curatorial facility of the contributing country within six months after return to the NASA Astromaterials Curatorial Facility. It is expected that the amount of sample so transferred will be approximately proportional to the non-U.S. contribution, but in no case will be more than one-third of the total sample. Any material allocated to foreign members of the Science Team during the Preliminary Examination period shall be included in this one-third limitation. The terms and conditions of selection of a sample fraction for transmission to the contributing country must be specified in the mission proposal. However, in the event that the mission is selected, the final arrangements for the transfer of a fraction of the sample to the contributing country must be established through an exchange of letters or a Memorandum of Understanding (MOU) between

NASA (with approval of the Astromaterials Curator) and the contributing foreign participant.

5.2.3 Forward and Back Contamination

Discovery investigations will also be subject to the established protocols that address forward and back contamination with respect to other solar system bodies. In particular, it should be noted that the forward contamination of Jupiter's satellites is of concern, and the return of samples from certain target bodies may be subjected to rigorous containment and biohazard testing protocols in accordance with NASA planetary protection policy (NASA Policy Directive 8020.7E "Biological Contamination Control for Outbound and Inbound Planetary Spacecraft" or current revision as listed in the DPL). Therefore, investigators proposing sample return missions must address their plans to comply with planetary protection requirements (also see Appendix B, Section J.6 of this AO). The additional curation costs generated by any special requirements will be borne by the mission. For additional information, proposers may contact the NASA Planetary Protection Officer, Dr. John D. Rummel (telephone (202) 358-0702; E-mail: john.d.rummel@nasa.gov).

5.2.4 Data Rights Policy

Data must be made fully public through the PDS, in a usable form, within six months following its collection. Discovery teams will be responsible for collecting the scientific, engineering, and ancillary information necessary to validate and calibrate the scientific data prior to delivery to the PDS. Archival data products shall include low-level (raw) data, high-level (processed) data, and derived data products such as maps, ancillary data, calibration data (ground and in-flight), documentation, and related software or other tools necessary to interpret the data. All data products shall be documented, validated, and calibrated in physical units usable by the scientific community at large.

The time required to complete this process shall be the minimum necessary to provide appropriate data to the scientific community and the general public and must be described in the proposal. However, a short period for exclusive rights to data may be proposed with justification. The proposed period of exclusivity should be the shortest period that is consistent with optimizing the science return from the mission and, except under exceptional circumstances, may not exceed six months, since neither any follow-on NASA DAPs nor inclusion in the Discovery DAP will be initiated until the data have been delivered to the PDS.

5.2.5 Data Analysis Activities

Investigation teams must also include an adequately funded data analysis period (independent of PDS archiving activities) as part of their proposed Phase E activities. Data analysis should be understood to include publication of scientific results of the investigation in peer-reviewed journals.

It is OSS policy to emphasize and encourage the addition of PSPs and DAPs to broaden the scientific impact of missions. These programs are usually initiated no earlier than Phase E. GO programs may also be proposed if appropriate for the mission. Although OSS will independently solicit and administer these programs using competitive peer review, if such a program is proposed, the costs of implementing it must be included in the proposer's estimate of the NASA OSS Cost (Section 5.9.1). Proposers should also note the existence of the Discovery-wide DAP; Discovery mission data sets will be included in this program after delivery of the data and supporting material to the PDS. Investigations that include adequately funded PSPs, DAPs, and GOs, where appropriate, will receive additional consideration at the time of selection.

5.3 Technical Approach

5.3.1 Adherence to Accepted Management Processes and Practices

Discovery projects must encompass all technical aspects of the investigation from Phase B through delivery of the data to the PDS and their analysis during Phase E. The document NPR 7120.5B, *NASA Program and Project Management Processes and Requirements,* delineates activities, milestones, and products typically associated with Formulation and Implementation of projects and may be used as a reference in defining a team's mission approach. NPR 7120.5B may be found in the DPL. All missions must adhere to NPR 7120.5B in order to receive approval for implementation. While NPR 7120.5B does not define subphases, OSS has defined "Formulation" as Phases A and B, and "Implementation" as Phases C, D, and E.

While mission teams have the freedom to use their own processes, procedures, and methods to meet the requirements of NPR 7120.5B, they must plan to obtain Independent Verification and Validation (IV&V) from the NASA IV&V Facility in Fairmont, West Virginia, for all flight and ground software. IV&V must be accomplished in accordance with NPD 8730.4 (found in the DPL). The NASA IV&V Facility provides an on-line self-assessment process, available at http://ivvcriteria.ivv.nasa.gov/, as a starting point for the proposal team to understand the risk and specific software development characteristics of their mission. The costs for the NASA IV&V Facility in West Virginia will be covered by NASA. Note that this IV&V is not intended to substitute for good practice software verification and validation performed by the project.

Finally, each Discovery project shall have a cost-effective mission assurance program that is consistent with the ISO 9000 series, American National Standard, *Quality Management Systems – Requirements, ISO 9001:2000* (DPL).

The mission will require environmental review documentation consistent with NASA policy and procedures (14 CFR Part 1216, Subpart 1216.3 and NPR 8580.1), the National Environmental Policy Act of 1969, as amended (NEPA) (42 U.S.C. 4321 *et seq*.), and the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural

Provisions of NEPA (40 CFR Parts 1500-1508). Depending on the potential environmental impacts of the proposed mission, either (1) adoption of the "Final Environmental Assessment of NASA Routine Payloads on Expendable Launch Vehicles from Cape Canaveral Air Force Station Florida and Vandenberg Air Force Base California," dated June 2002 and Finding of No Significant Impact (FONSI) dated June 18, 2002, (2) preparation of a mission unique Environmental Assessment, or (3) preparation of a mission unique Environmental Impact Statement will be necessary to satisfy NEPA requirements. Additionally, if the mission has the potential to have environmental effects abroad (e.g. launches from a foreign territory) then the mission will require environmental review documentation consistent with NASA policy and procedures for complying with Executive Order 12114 (14 CFR part 1216.321) and NPR 8580.1.

5.3.2 Use of Radioactive Materials

Flight of substantial quantities of nuclear material can greatly increase the cost and schedule risk of a mission. Therefore, radioisotope based sources of electrical power requiring a substantial quantity of nuclear material, such as Multi-Mission Radioisotope Thermoelectric Generators (MMRTGs), are <u>not</u> permitted for missions proposed in response to this AO. The use of smaller radioactive sources, such as radioisotope heater units (RHUs), or radioactive material sources for science instruments is permitted. However, even this usage will require additional environmental review documentation consistent with NASA policy and procedures (14 CFR Part 1216, Subpart 1216.3), the National Environmental Policy Act of 1969, as amended (NEPA) (42 U.S.C. 4321 *et seq*.), and the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 CFR Pars 1500-1508). These documents are also listed in the DPL, Appendix D. Missions that use RHUs will be also be required to complete a separate administrative process for nuclear safety launch approval (Presidential Directive/National Security Council Memorandum No. 25). If RHUs are proposed for a selected and confirmed investigation, they will be provided by NASA as Government Furnished Equipment (GFE) through the Department of Energy, however, their costs must be included in the proposal as described in Section 5.9.1 of this AO. The technical and cost parameters of RHUs may be found in *Specifications for Radioisotope Heater Units (RHUs) for Discovery* listed in the DPL.

Depending on the nature and amounts of radioisotopes in science instrument sources and other potential environmental impact factors, either adoption of the "Final Environmental Assessment of NASA Routine Payloads on Expendable Launch Vehicles from Cape Canaveral Air Force Station Florida and Vandenberg Air Force Base California," dated June 2002 and Finding of No Significant Impact (FONSI) dated June 18, 2002 or generation of a separate Environmental Assessment (EA) will be required for NEPA compliance. This separate EA, if prepared, will form the basis for NASA's decision to either issue a Finding of No Significant Impact or prepare an EIS.

Use of an RHU will require preparation of either an Environmental Assessment or an Environmental Impact Statement to satisfy the NEPA requirements and completion of a detailed and rigorous nuclear safety launch approval process.

Sufficient resources (cost and schedule) must be budgeted in the proposal to secure these units and support the development, submittal, and approval of the necessary NEPA process and the Nuclear Safety Launch Approval process. More information may be found in the *Specifications for Space Radioisotope Power Systems (RPS) for Discovery* documents and the *Discovery Launch Services Information Summary* document listed in the DPL. Questions concerning NEPA may be posed to the NASA NEPA Coordinator, Kenneth Kumor (telephone: (202) 358-1112; E-mail: kenneth.m.kumor@nasa.gov), or Environmental Specialist Ann Clarke (telephone: (202) 358-0007; E-mail: ann.clarke@nasa.gov). Questions concerning the Nuclear Safety Launch Approval Process may be posed to Discovery PE Steve Brody (telephone: (202) 358-0889; E-mail: steve.brody@nasa.gov).

5.3.3 Telecommunications, Tracking, and Navigation Issues

The Jet Propulsion Laboratory (JPL) may provide navigation, tracking, control, and/or communication services for Discovery missions if the proposer so requests. Cost information for these services (*NASA's Mission Operations and Communications Services*) is provided in the DPL.

5.4 Management

5.4.1 Single Principal Investigator

A single PI must be designated in each proposal and is the central person in charge of each Discovery investigation, with full responsibility for its scientific integrity and for the integrity of all other aspects of the mission including the E/PO program. The PI is responsible for assembling a team to propose and implement a Discovery investigation. The PI is accountable to NASA for the scientific success of the investigation and must be prepared to recommend project termination when, in his/her judgment, the successful achievement of established minimum science objectives, as defined in the proposal as the Performance Floor (see Section 5.11.3), is not likely to be achievable within the committed cost and schedule reserves.

5.4.2 Management Plans and Structure for Flight Investigations

NASA intends to give the PI and his/her team the ability to use their own management processes, procedures, and methods to the fullest extent possible. Therefore, proposers to this AO should define the management approach (compliant with NPR 7120.5B) best suited for their particular teaming arrangement commensurate with the investigation's implementation approach, while retaining a simple and effective management structure that assures adequate control of development within the cost and schedule constraints.

The investigation team must develop a Work Breakdown Structure (WBS) that best fits its organizational approach and mission design concept (see also Appendix B).

Each Discovery investigation proposal must have a fully qualified and experienced PM who will oversee the technical implementation of the project. This PM must be named at time of proposal. The role, qualifications, and experience of the PM must be adequate to ensure that the technical and managerial needs of the investigation will be met (see the *Discovery Program Plan* in the DPL). A deputy PM is strongly recommended. Any replacement of key personnel (including but not limited to the PI, PM, deputy PI, deputy PM, industry lead, and instrument leads) requires concurrence by the NASA Discovery Program Management, described in the next section.

5.4.3 NASA Program and Project Management

Program Direction for Discovery will reside within the OSS Solar System Exploration Division (SSE) at NASA Headquarters. The Deputy Director for the Solar System Exploration Division also serves as the Discovery Program Director. The Discovery Program Director is responsible for program-wide organization, policy, budgets, oversight, and performance assessment.

A Program Scientist has also been assigned to the Discovery Program. The Discovery Program Scientist develops and promulgates the Discovery AOs, plans and organizes the scientific and technical review of proposals submitted in response to these AOs, and works with the Discovery Program Director in the formulation of recommendations for selections.

Owing to the high cost and the greater complexity expected of Discovery missions, NASA intends to maintain a significant degree of insight into mission development. To that end, the Associate Administrator for Space Science has established a New Frontiers and Discovery Program Office at JPL which will be responsible for the implementation of the Program; oversight; coordination of Government-furnished services, equipment, and facilities; and contract management of Discovery investigations selected by NASA. The Discovery Program Manager at JPL reports to the Discovery Program Director at NASA Headquarters.

While NASA Headquarters will manage and lead the evaluation and selection of proposals submitted in response to this AO, the Discovery & New Frontiers Program Management Office at JPL will award and administer contracts made to all successful offerors.

5.4.4 Risk Management

Every Discovery investigation must define the risk management approach it intends to use to ensure successful achievement of the investigation objectives within established resource and schedule constraints. Included in this discussion of risk management must

be risk mitigation plans for any new technologies, or for any nontrivial modification or upgrade to existing technology proposed for the mission. The proposal must demonstrate a clear understanding of the specific risks inherent in any such new development for the proposed investigation, and include the appropriate risk mitigation approach. Discuss the need for any long-lead items that need to be placed on contract before the start of Phase C to ensure timely delivery of flight hardware and software. Also, discuss the role of potential descopes in risk mitigation. Proposals that include international participation must address the risk resulting from any international contributions to the proposed mission (Section 5.10). In addition, any manufacturing, test, or other facilities needed to ensure successful completion of the proposed investigation must be identified in every Discovery proposal.

5.5 Co-Investigators

A Co-Investigator (Co-I) is defined as an investigator who plays a necessary role in the proposed investigation and whose services are either funded by NASA or are contributed by his/her employer. If funded by NASA, costs must be accounted for in the NASA OSS Cost. If contributed, the costs must be accounted for in the Total Mission Cost and an endorsement letter from the proposed Co-I's institution must be provided with the proposal.

The role of each Co-I must be described in the proposal (see Appendix B for additional details). Note that the identification of an unjustified number of Co-Is may result in downgrading of an investigation and/or the offer of only a partial selection by NASA (see Section II of Appendix A). In this regard, proposers should consider proposing a PSP (see Section 5.2.5) in place of Co-Is whose only roles would be extensive data analyses during Phase E.

5.6 Education and Public Outreach (E/PO)

The National Aeronautics and Space Administration's (NASA) Vision Statement,

To improve life here, to extend life to there, and to find life beyond,

and Mission Statement,

- *To understand and protect our home planet;*
- *To explore the Universe and search for life*
- *To inspire the next generation of explorers*

…as only NASA can.

provide context for the NASA Education program. As part of its response to this mandate, OSS is committed to fostering the broad involvement of the space science research community in Education and Public Outreach (E/PO) with the goal of enhancing the nation's formal education system and contributing to the broad public understanding of science, mathematics, and technology. Progress towards achieving this goal has

become an important part of the broad justification for the public support of space science. In addition, an enhanced, coordinated Agency-level education program is now being undertaken through the new NASA Office of Education that constitutes the Agency's sixth enterprise. NASA's Education objectives, and the OSS areas of emphasis in E/PO directed towards meeting those objectives, are given in the table below.

In accordance with established OSS policies, E/PO will be an integral element of the Discovery Program; 1 to 2 percent of the NASA OSS Cost (excluding launch vehicles) will be allocated to E/PO. OSS strongly encourages space science researchers to engage actively in education and public outreach as an important component of their NASA – supported professional activities. The key documents that establish the basic policies and guidance for all OSS E/PO activities are *Partners in Education: A Strategy for Integrating Education and Public Outreach Into NASA's Space Science Programs* (March 1995), *Implementing the Office of Space Science Education/Public Outreach Strategy* (October 1996), and the *Explanatory Guide to the NASA Office of Space Science Education and Public Outreach Evaluation Criteria* (March 2004). Additional information concerning NASA Education and Public Outreach may be found in the NASA Education Enterprise Strategy (October 2003) at http://education.nasa.gov/pdf/55377main_32915-Education_508.pdf and the Space Science Enterprise Strategy (October 2003) at http://spacescience.nasa.gov/admin/pubs/index.htm. These documents may also be obtained in hard copy from Dr. Philip J. Sakimoto, Office of Space Science, Code S, NASA Headquarters, Washington DC 20546; E-mail: philip.j.sakimoto@nasa.gov .

As a consequence of the plans and policies that have been established and implemented over the past several years, a significant national OSS E/PO program is now underway as described in the OSS E/PO Newsletters and the Annual Reports that may be accessed by opening the "Education" link on the OSS homepage at http://spacescience.nasa.gov. Instructions for the E/PO component of the proposal are contained in Appendix B. A detailed E/PO implementation plan will developed by each investigation selected through this AO as part of its Phase A Concept Study. As outlined in Section 7.3, plans for E/PO will play an explicit role in the evaluation of the Concept Studies leading to the confirmation of investigation(s) for implementation leading to flight. See the document Guidelines and Criteria for the Phase A Concept Study (in the DPL) for additional information. Also note that significant elements of this AO's goal for involvement of SDBs and minority institutions (see Section 5.8) may be met through an appropriately planned E/PO program.

Questions and/or comments and suggestions about the OSS E/PO program are welcome; they may be directed to Dr. Larry P. Cooper (telephone: (202) 358-1531; E-mail: larry.p.cooper@nasa.gov).

NASA Mission Statement*: *To Inspire the Next Generation of Explorers

NASA Strategic Goal 6: Inspire and motivate students to pursue careers in science, technology, engineering, and mathematics.

NASA Objectives	OSS Areas of Emphasis
1. Increase the number of elementary and secondary students and teachers who are involved in NASA-related education opportunities.	a) Provide opportunities for students to work directly with NASA space science missions, facilities, and data. b) Take advantage of the advanced-technology nature of the Space Science Enterprise's programs to develop new materials and new programs in technology education
2. Support higher education research capability and opportunities that attract and prepare increasing numbers of students and faculty for NASA-related careers.	Continue to contribute to the professional training of scientists by supporting research assistantships and postdoctoral opportunities offered through Space Science Enterprise research awards and through other NASA research and higher education programs.
3. Increase the number and diversity of students, teachers, faculty, and researchers from underrepresented and underserved communities in NASA-related science, engineering, mathematics, and technology (STEM) fields.	Increase opportunities of diverse populations to participate in space science missions, research, and education and outreach programs: a) Continue and expand our efforts to develop space science capabilities at minority institutions. b) Develop and enhance partnerships with special interest organizations such as professional societies of minority scientists. c) Develop working partnerships and coordinate with the diversity initiatives of scientific professional societies. d) Extend the accessibility of space science E/PO programs and products to an increasingly broad population, including girls, residents of rural areas, and persons with disabilities.
4. Increase student, teacher, and public access to NASA education resources via the establishment of e-Education as a principal learning support system.	Improve the coherence of NASA Space Science materials for educators by building a framework that will show the appropriate standards-aligned sequencing of space science topics throughout the K–12 years for the materials being produced by individual missions.

NASA Strategic Goal 7: Engage the public in shaping and sharing the experience of exploration and discovery.

NASA Objectives	OSS Areas of Emphasis
1. Improve public understanding and appreciation of science and technology, including NASA aerospace technology, research, and exploration missions.	a) Build on strong mutual interests between the Space Science Enterprise and the science center, museum, and planetarium communities by continuing to provide space science content, materials, and technical expertise to support the development of

a) Improve science literacy by engaging the public in NASA missions and discoveries, and their benefits, through such avenues as public programming, community outreach, mass media, and the Internet.	exhibitions and programs. b) Seek out and capitalize on special events and particularly promising opportunities in our scientific program to involve the public in the process of scientific discovery and to use space science to improve STEM education at all levels. c) Enrich the science, mathematics, engineering, and technology education efforts of community groups such as the Girl Scouts, 4-H Clubs, and Boys and Girls Clubs through the introduction of space science.

5.7 Advanced Technology

NASA seeks to infuse new technologies into its programs and to strengthen the mechanisms by which it transfers such technologies to the private sector, including the non-aerospace sector. Please refer to the Office of Space Science Integrated Technology Strategy, also referenced in the DPL, for more details.

5.8 Subcontracting Plans

Offerors other than small business concerns are advised that contracts resulting from this AO will be required to contain a subcontracting plan that includes goals for subcontracting with small, small disadvantaged (including HBCUs and MEIs), women-owned, veteran-owned, service-disabled veteran-owned, and Historically Underutilized Business (HUB) Zone small business concerns. Investment in these organizations reflects NASA's commitment to increase the participation of small business in the aerospace community, and it is to be viewed as an investment in the nation's future. Proposers to this AO are expected to use their best efforts to assist NASA in achieving its goal for the participation of all forms of small business in NASA procurements.

Note that substantial involvement of minority colleges and universities in space science missions and research programs is also a key objective of the OSS E/PO program.

Instructions for the SDB and Minority Institutions component of the proposal are contained in Appendix B. See the document *Guidelines and Criteria for the Phase A Concept Study* in the DPL for additional information.

5.9 Costs

5.9.1 NASA OSS Cost and Total Mission Cost

A major goal of the Discovery Program is to provide the highest science value for the cost. Therefore, the NASA OSS Cost will be one factor in the selection of Discovery investigations and in the continuing assessment of ongoing Discovery investigations. All proposals must provide an estimate of the NASA OSS Cost.

The NASA OSS Cost is defined as the funding that NASA OSS would be expected to provide to complete the investigation, including the cost of the Phase A Concept Study, all costs in Phases B through E, and an unencumbered reserve through the end of Phase B of at least 25 percent of all costs to go through the end of Phase D (excluding only the cost of the ELV). A cost reserve for Phase E should also be included as appropriate. Generally, all costs must be included as NASA OSS costs unless specifically excluded. Examples of costs to be included in all proposals are: launch services (see Section 5.11.2); RPSs (see Section 5.3.2); E/PO activities (see Section 5.6); subcontracting costs (including fees); science Co-Is; all other personnel required to conduct the investigation, analyze and publish results, and deliver data in archival format to the PDS; insurance; NASA Deep Space Network (DSN), if required, and other Deep Space Mission System (DSMS) support, if required (see *NASA's Mission Operations and Communications Services* document in the DPL); Navigation and Ancillary Information Facility (NAIF) services; NASA curatorial support (if required; see Section 5.2.2); and all labor (including contractor and Civil Servant).

In addition, proposals must provide an estimate of Total Mission Cost, defined as the NASA OSS Cost plus any additional costs that are contributed or provided in any way other than through OSS. The Total Mission Cost will define the total value of the Mission or MO investigation and must be included in a required cost table with the proposal (see Appendix B).

Sections 5.11.5 and 5.11.6 of this AO describe additional cost elements and caps on the NASA OSS Cost, Total Mission Cost, and major mission element costs for Discovery Mission investigations.

Section 5.12.7 describes additional cost elements specific to MO investigations and specifies the NASA OSS Cost cap for MO investigations.

As noted in Section 5.2, costs for a PSP, DAP, and/or a GO, if any of these are proposed, must be included in the estimate of NASA OSS Cost and will count against the cost caps specified in Section 1.1. Costs for a proposed Phase F will not count against the cost caps.

The specific cost information required for proposals is described in Appendix B. Since the provision of cost details is not anticipated until the conclusion of the Phase A Concept Study, cost estimates in the proposal may be generated using models or cost estimating relationships from analogous missions. However, for selected investigations, the proposed cost to NASA OSS shall not increase by more than 20 percent from that in the original proposal to that in the Concept Study Final Report, and in any case shall not exceed the Discovery Program cost constraints (see Appendix F). Experience in NASA's Discovery and Explorer Programs has shown that mission costs tend to grow in Phase A and beyond as costs and challenges are better understood; therefore, proposers are advised to allow for room for this cost growth, up to the Discovery cost cap. Discovery mission investigations must show (through the end of Phase B) a credible reserve of at least 25

percent of cost to go through the end of Phase D. Since costs and obligation authority may well be different, it is incumbent on proposers to define any obligation requirement that exceeds planned costs. Proposers should be advised that rephasing of Phase E funds to Phases C or D after confirmation of an approved investigation is not permitted.

5.9.2 Full Cost Accounting for NASA Facilities and Personnel

Where NASA-provided services are used, NASA Civil Service labor and supporting NASA center infrastructure must be costed on a full cost accounting basis. NASA field centers may submit full cost proposals based on the instructions in the NASA Financial Management Manual, Section 9091-5, *Cost Principles for Reimbursable Agreements* (see Appendix D). If any NASA costs are to be considered as contributed costs, the contributed item(s) must be separately funded by an effort complementary to the proposed investigation and the funding sources must be identified. Any non-NASA Federal Government elements of proposals must follow their agency cost accounting standards for full cost. If no standards are in effect, the proposers must then follow the Managerial Cost Accounting Standards for the Federal Government as recommended by the Federal Accounting Standards Advisory Board.

5.9.3 Contributions

Contributions, including services, from non-OSS U.S. and non-U.S. sources are welcome. These may include contributions to the payload, to the spacecraft, and/or to the launch services, subject to the following exceptions and limitations: (i) non-U.S. launch services for payloads containing nuclear power sources of any kind are prohibited; (ii) non-U.S. nuclear power sources are prohibited; and in order to ensure a preponderance of U.S. interest in the mission as well as to ensure that missions of roughly comparable scope are proposed for purposes of equitable competition, (iii) the sum of contributions of any kind to the entirety of the flight hardware for a Discovery Mission investigation may not exceed one third (1/3) of the estimated total cost in U.S. dollars. Contributed non-U.S. launch services for payloads that do not contain nuclear power sources of any kind are permitted.

Values for all contributions of property and services shall be established in accordance with applicable cost principles. Such contributions may be applied to any part or parts of a mission, although it should be noted that a contributed item that is in the critical path of mission development may be identified as a risk factor, especially in the case of contribution(s) from non-U.S. source(s) (see provisions for international risk management in Section 5.10). Such contributions will not be counted against the NASA OSS Cost cap, but they must be included in the calculation and discussion of the Total Mission Costs (Section 5.9.1). A Letter of Endorsement that contains a statement of financial commitment from each responsible organization contributing to the investigation, signed by an official who is authorized to commit the resources of the organization, must be submitted with the proposals, to assure NASA that all contributions will be provided as

proposed. Any proposal failing to provide Letters of Endorsement from U.S. and non-U.S. partners with the submitted proposal will be judged non-compliant and returned.

The cost of contributed hardware should be estimated as either: (1) the cost associated with the development and production of the item if this is the first time the item has been developed, and if the mission represents the primary application for which the item was developed; or (2) the cost associated with the reproduction and modification of the item (*i.e.,* any recurring and mission-unique costs) if this is not a first-time development. If an item is being developed primarily for an application other than the one in which it will be used in the proposed investigation, then it may be considered as falling into the second category (with the estimated cost calculated as that associated with the reproduction and modification alone).

The cost of contributed labor and services should be consistent with rates paid for similar work in the proposer's organization. The cost of contributions does not need to include funding spent before the start of the investigation (*i.e.*, before initiation of Phase B if confirmed for flight). The value of materials and supplies shall be reasonable and shall not exceed the fair market value of the property at the time of the contribution.

5.10 International Participation

5.10.1 Overview

NASA uses AOs to solicit research proposals from both U.S. and non-U.S. sources (see NASA FAR Supplement 1835.016-70 at http://www.hq.nasa.gov/office/procurement/regs/nfstoc.htm). Because of NASA's policy to conduct research with foreign entities on a cooperative, no-exchange-of-funds basis, NASA does not normally fund foreign research proposals or foreign research efforts that are part of U.S. research proposals. Rather, cooperative research efforts are normally implemented via international agreements between NASA and the foreign entity involved. Thus, foreign proposers, whether as primary proposers or as participants in U.S. research efforts, are expected to arrange for non-U.S. financing for their portion of the research.

5.10.2 Additional Guidelines Applicable to Foreign Proposals and Proposals Including Foreign Participation.

NASA welcomes proposals from outside the U.S. However, foreign entities are generally not eligible for funding from NASA. Therefore, unless otherwise noted, proposals from foreign entities should not include a cost plan unless the proposal involves collaboration with a U.S. institution, in which case a cost plan for only the participation of the U.S. entity must be included. Proposals from foreign entities and proposals from U.S. entities that include foreign participation must be formally endorsed by the respective government agency or funding/sponsoring institution in the country from which the foreign entity is proposing. Such endorsement should indicate that the proposal merits careful

consideration by NASA, and, if the proposal is selected, sufficient funds will be made available to undertake the activity as proposed. These letters of endorsement must be signed by an official who is authorized to commit the resources of the organization. All foreign proposals must be typewritten in English and comply with all other submission requirements stated in the AO. All foreign proposals will undergo the same evaluation and selection process as those originating in the U.S. All proposals must be received before the established closing date. Those received after the closing date will be treated in accordance with Appendix A, Section VII, of this AO.

Successful and unsuccessful foreign entities will be contacted directly by the NASA sponsoring office. Copies of these letters will be sent to the foreign sponsor. Should a foreign proposal or a U.S. proposal with foreign participation be selected, NASA's Office of External Relations will arrange with the foreign sponsor for the proposed participation on a no-exchange-of-funds basis, in which NASA and the foreign sponsor will each bear the cost of discharging their respective responsibilities.

Depending on the nature and extent of the proposed cooperation, these arrangements may entail:

(i) An exchange of letters between NASA and the foreign sponsor; or
(ii) A formal Agency-to-Agency Memorandum of Understanding (MOU).

5.10.3 Export Control Guidelines Applicable to Foreign Proposals and Proposals Including Foreign Participation

Foreign proposals and proposals including foreign participation must include a section discussing compliance with U.S. export laws and regulations, e.g., 22 CFR Parts 120-130 and 15 CFR Parts 730-774, as applicable to the circumstances surrounding the particular foreign participation (see also documents listed in Appendix C). The discussion must describe in detail the proposed foreign participation and is to include, but not be limited to, whether or not the foreign participation may require the prospective proposer to obtain the prior approval of the Department of State or the Department of Commerce via a technical assistance agreement or an export license, or whether a license exemption/exception may apply. If prior approvals via licenses are necessary, discuss whether the license has been applied for or if not, the projected timing of the application and any implications for the schedule. Information regarding U.S. export regulations is available at http://www.pmdtc.org and http://www.bis.doc.gov. Proposers are advised that, under U.S. law and regulations, spacecraft and their specifically designed, modified, or configured systems, components, and parts are generally considered "Defense Articles" on the United States Munitions List and subject to the provisions of the International Traffic in Arms Regulations (ITAR), 22 CFR Parts 120-130.

5.11 Specific Requirements and Constraints for Discovery Mission Investigations

5.11.1 Overview

Discovery Mission investigation proposals must be for complete, free-flying missions. The PI is responsible to NASA not only for the scientific integrity of the investigation, but also for the management of the complete mission, including provision of the spacecraft, instrument, and ground system. Proposals submitted in response to this AO for Discovery Mission investigations must be for complete investigations from project initiation (Phase A) through mission operations (Phase E), which is to include analysis and publication of data in the peer reviewed scientific literature, delivery of the data to the PDS, and full implementation of the mission's E/PO program.

5.11.2 Launch Services

Discovery Mission investigations may be launched as primary, secondary, or co-manifested payloads on expendable launch vehicles (ELVs). ELVs may either be provided by NASA with NASA funding or by the proposer as a contribution. Detailed information on ELV launch options, including their nominal costs, is contained in the *Discovery Launch Services Information Summary* document listed in the DPL.

NASA will provide launch services only for a medium class (Delta II 7925H) or smaller expendable launch vehicle, as described in the *Discovery Launch Services Information Summary* in the DPL. The launch service costs of any NASA-provided ELV must be included in the proposal's NASA OSS Cost (Sections 5.9.1 and 5.11.5) and Total Mission Cost (Section 5.11.6). If the investigation is selected, NASA expects to contract with the appropriate U.S. launch service provider to acquire the launch service for the investigation. Note: NASA seeks to take advantage of all reasonable sources of commercial ELV services while assuring that NASA-funded payloads are not exposed to excessive risk; therefore, demonstrated reliability of the proposed launch vehicle and the resultant probability of mission success will be evaluated by NASA and factored into the feasibility of mission implementation evaluation criteria (see Section 7.2).

Launch services may also be proposed at no cost to NASA as part of a teaming proposal with a non-U.S. partner. Such launch services must be consistent with NASA Policy Directive (NPD) 8610.7, *NASA Launch Services Risk Mitigation Policy* (in the DPL). Whether the mission is proposed for launch as a primary or secondary payload on a contributed ELV, the proposer must identify the opportunity and provide evidence in the proposal that the launch service provider agrees to manifest the investigation should the proposal be selected and confirmed for flight.

It is the responsibility of the proposer to find an organization that will contribute a launch if a contributed launch is part of the proposal. The demonstrated reliability and the resultant probability of mission success will be evaluated as described above. The use of

non-U.S. provided launch services may be proposed must also meet the additional constraints and requirements of Sections 5.9.3 and 5.10.

5.11.3 Baseline Mission and Performance Floor

Every Discovery Mission investigation must specify a "Baseline" mission and a "Performance Floor" Mission defined as follows: The Baseline mission is the mission that, if fully implemented, will accomplish the entire set of scientific objectives proposed for the investigation. Any alteration that results in a reduction of the mission's ability to accomplish the Baseline set of scientific objectives as identified in the proposal will be considered a descope of the investigation. The resulting reduced set of achievable scientific objectives will be reviewed to ensure that the investigation remains at or above the Performance Floor, which is defined as the minimum science return below which the investigation will not be considered justified for the proposed cost. The Performance Floor must be identified and documented for a proposed Discovery Mission investigation along with a plan for the prioritized descoping of mission capability from the Baseline to the Performance Floor in the event of cost or schedule growth or for risk mitigation. The differences between the Baseline Mission and the Performance Floor will be assessed to determine the mission's resiliency in the event that development problems lead to reductions in scope. In addition, each selected PI will be required to negotiate a set of performance metrics during the definition phase for program evaluation, including cost, schedule, and others as appropriate. Failure to maintain a level of science return at or above the Performance Floor as determined by NASA will be cause for termination of the investigation.

5.11.4 Schedule

The Discovery Program is intended to accomplish frequent, important scientific planetary science investigations within a short span of time. Accordingly, every Discovery Mission investigation to be selected through this AO is expected to launch no later than December 31, 2009. Proposers must specify the desired launch date and indicate any flexibility in their proposals. Furthermore, schedules must be such that launch takes place within 35 months from the start of the mission design/development phase (Phase C). Since this phase is defined as ending 30 days after launch, the maximum permissible length of any Discovery mission from the beginning of Phase C to the end of Phase D is 36 months.

Note that OSS defines the Concept Study as Phase A and defines Phase B as a preliminary design phase ending approximately one month after the Preliminary Design Review (PDR). No constraint is placed on the length of Phase B or Phase E (operations). Procurement of long lead materials is permitted during the Phase B timeframe, but, if proposed, it must be accounted as an Implementation Task (Phases C and D) and, therefore, as an Implementation cost. The Implementation Phase long-lead procurement overlap with Phase B will not be considered when determining the length of Phases C and D. Options for extended missions (Phase F) must be proposed, if appropriate, with the understanding that NASA has no commitment to exercise them (see Section 5.2.1).

5.11.5 NASA OSS Cost Requirements and Cost Caps

The Discovery Program is intended to provide opportunities for planetary science investigations of modest scope. Accordingly, NASA OSS will cap its funding for Discovery Mission investigations, including all mission phases and launch services, at $360M (FY 2004 dollars). The NASA OSS annual funding profile available for missions selected under this AO is given in Appendix F.

As noted in Section 5.9.1, NASA will provide for launch services, but the cost of these services must be included in the proposal and will count against the cap on the NASA OSS Cost. Proposed PSPs, DAPs, and GOs administered by NASA Headquarters will count against the NASA OSS Cost cap. Proposed Phase F investigations will neither count against the cap nor be confirmed for implementation until after launch.

NASA will provide for radioisotope heater units as GFE through the Department of Energy (see Section 5.3). As with launch services, however, the cost of such devices must be included in the proposal and will count against the cap on the NASA OSS Cost (their costs, for proposal purposes, are described in the document *Specifications for Space Radioisotope Power Systems (RPS) for Discovery* in the DPL).

The specific cost information required for Discovery mission proposals is contained in Appendix B.

5.11.6 Total Mission Cost

The Total Mission Cost is defined as all costs that are necessary to complete an investigation, from selection through Phase E or Phase F (if applicable), including NASA OSS costs, other NASA costs, non-NASA Civil Servant costs, and contributions from U.S. and non-U.S. entities. In general, proposers should assume that all costs must be included unless they are specifically excluded. Proposers must estimate the Total Mission Cost in the proposal as described in Appendix B, Table B-1.

The Total Mission Cost, including contributions, may exceed the cap on total cost to NASA OSS ($360M FY 2004). However, as noted in Section 5.9.3, the sum of contributions of any kind to the entirety of the flight hardware for a Discovery Mission investigation from non-U.S. sources may not exceed one third (1/3) of the estimated total cost in U.S. dollars.

5.11.7 Concept Study

Each Discovery investigation selected through this AO will be awarded funding (up to $1M in RY$) to conduct a Phase A Concept Study of up to 6 months, which must be budgeted as part of the initial proposal (see the *Guidelines and Criteria for the Phase A Concept Study* available in the DPL). At the conclusion of the Concept Studies, it is

anticipated that one or two investigations will be confirmed to proceed into subsequent mission phases (see Section 1.2). NASA will not continue funding for those investigations not selected to proceed.

During the Concept Study, the NASA OSS Cost shall not increase by more than 20 percent from that offered in the original proposal and, in any event, must not exceed the total cost cap. Thereafter, cost shall not increase from that offered in the Concept Study. Each Concept Study must conclude with a commitment from the PI for the cost, schedule, and scientific performance of the investigation. If at any time the cost, schedule, or scientific performance commitments appear to be in jeopardy, the investigation will be subject to cancellation.

5.11.8 International Participation

Any proposed international participation in a Discovery mission must be described at the same level of detail as that of U.S. partners, to the maximum extent practicable. NASA will seek to validate contribution cost, schedule, and management data during evaluation of the proposal and in subsequent reviews. Failure to provide such information about proposed contributions, or failure to document the commitment of all team partners to those costs and schedules, may cause a proposal to be found unacceptable for selection through this AO.

5.12 Specific Requirements and Constraints for Mission of Opportunity Investigations

5.12.1 Overview

By supporting U.S. participation in MO investigations, NASA seeks to allow the U.S. scientific community to conduct a science investigation of interest to OSS as part of missions sponsored by non-OSS organizations and/or using existing flight hardware for missions that have completed their prime science missions. Such "parent" non-OSS missions may be sponsored by non-U.S. governments, other U.S. agencies, NASA organizations other than OSS, the U.S. military (only if the satellite is not planned for weapons testing), or private sector organizations, and all are equally qualified. Mission extensions and proposals for new science missions that utilize existing in-flight OSS spacecraft are also allowed in this opportunity. The total cost to NASA for a Discovery MO investigation, including all costs for Deep Space Mission System (DSMS) support and/or Navigation and Ancillary Information Facility (NAIF) services, through this AO is limited to $35M (FY 2004 dollars).

Discovery MO investigations may take several forms, as detailed in Sections 5.12.2, 5.12.3, and 5.12.4 below. In all cases, however, a Discovery MO investigation must address one of the science objectives of the OSS SSE (excluding Mars) or the extrasolar planet search element of ASO (see also Section 5.2 and the DPL) and must include appropriate provisions for the analysis of data and publication of results in the peer-

reviewed scientific literature and for the conduct of an E/PO program. MO investigations will be evaluated against the criteria described in Section 7.2 of this AO.

Ordinarily, a selected MO investigation will be expected to submit a Concept Study report to NASA for detailed review that must conclude with a commitment by the PI for the cost, schedule, and scientific performance of the proposed MO investigation. If, at any time, this commitment appears to be in jeopardy, the investigation will be subject to cancellation regardless of the impact this cancellation might have on its parent mission. As with other missions proposed to this AO, NASA funding is subject to cancellation if a cost overrun is likely to be charged to NASA for any reason, including one resulting from a launch delay caused by a non-OSS mission sponsor.

As noted in Section 1.2, NASA may select an MO investigation for immediate implementation (that is, without need for a Concept Study) provided that NASA is satisfied with its readiness for development and implementation as proposed. For such a selection, an MO proposal must (1) conform to these Discovery AO guidelines for an MO investigation, and (2) contain a commitment by the PI for the cost, schedule, and scientific and technical performance of the investigation with detail equivalent to that expected at the end of a Concept Study. The commitment must also be complete for the programmatic considerations included in Section 5 (*e.g.,* E/PO). Investigations selected in this manner will be subject to the same conditions for cancellation as described in the preceding paragraph.

A technical and programmatic review will be held prior to the start of Phase C. Assuming a positive outcome, NASA will confirm the investigation to proceed to development. As a condition for confirmation, the organization sponsoring the parent mission (for non-OSS missions) must commit to enter into an appropriate agreement with NASA that must include provisions for sharing of flight data necessary for the completion of the selected MO investigation.

5.12.2 Partner Missions

Proposals to conduct a science investigation of interest to OSS as part of missions sponsored by non-OSS organizations are welcome under this AO as MOs. The "parent" non-OSS missions may be sponsored by non-U.S. governments, other U.S. agencies, NASA organizations other than OSS, the military (only if the satellite is <u>not</u> planned for weapons testing), or private sector organizations, and all are equally qualified.

Discovery MO investigations may take many forms, such as providing a complete science instrument, providing hardware components of a science instrument sponsored by some organization other than NASA OSS, providing expertise in critical areas of the mission, and/or purchasing OSS-relevant data from the mission.

NASA will evaluate the proposed investigation, but not the sponsor's entire mission. While the investigator is not required to document the entire mission of the sponsor, the U.S. investigator must fully document the complete MO investigation in the proposal.

Note that selection by NASA through this AO does not constitute selection of the investigation as part of the parent mission, which necessarily is a decision made by the sponsor of that mission. Instead, selection through this AO only indicates the commitment by NASA to fund the NASA OSS portion of the proposed investigation through the Discovery program; funding beyond a limited basic study phase does not begin until detailed design of the parent mission itself is underway by its sponsor. If an investigation is selected both by NASA and by the mission sponsor, the U.S. MO PI is responsible to NASA for the scientific integrity and the management of his/her contribution to the mission.

5.12.3 Extended Science Missions

Approved NASA SSE missions nearing the end of their Prime or Extended Missions may propose a mission extension through this AO. The extended science mission being proposed must commence no later than December 31, 2005. A proposal for an extended science mission must include all costs to NASA for the extension of the mission including mission operations, DSMS costs, any proposed data analysis, and adequate resources for archiving new results.

5.12.4 New Science Missions

Under this AO, a mission extension using an existing NASA space asset to conduct a new science mission may be proposed as an MO investigation if it meets several specific criteria:

- The proposal must make use of a NASA spacecraft or other space asset that has completed its prime mission;
- The proposed mission extension must constitute a new science investigation and not be an extension, supplement, redirection, or follow-up of the spacecraft's original science mission or any previously approved mission extensions;
- The new science mission must constitute a science investigation addressing the scientific objectives of the SSE (excluding Mars) or ASO (see also Section 2.1 of this AO, Appendix III of the NASA 2003 Strategic Plan, and other documents in the DPL); and
- The proposal must be solely for mission operations and data analysis.

New science mission extensions are MOs in the sense that NASA may or may not select one or more new science mission extensions, and the cost cap for new science mission extensions is the MO investigation cost cap. Non-U.S. participation is allowed in proposals for new science mission extensions.

In addition to meeting other proposal requirements, an MO proposal for a new science mission extension must describe how the proposers will transition all aspects of mission operations and data analysis from the current spacecraft mission operations team to the proposed new science mission extension operations team. It is not required that the current mission operations team be a part of the new science mission extension proposal. However, in the case where the current mission operations team is not a part of the new science mission extension proposal, the proposer must show that operations can be transferred to the new science mission extension operations team with acceptable risk, and with adequate capture of engineering and operations knowledge and lessons learned.

All mission operations and data analysis costs must be included in the proposed budget.

5.12.5 Science Data Requirements

NASA recognizes that MO investigation teams may justifiably incur data analysis responsibilities defined by the policies of the sponsor of the parent mission. Nevertheless, NASA expects that the mission sponsor will enter into an agreement with NASA to assure that scientific data returned from at least those aspects of the mission in which NASA support is involved, if not from the entire mission, as may be appropriate, will be made available to the U.S. scientific community in a timely way and deposited in the PDS as described in Section 5.2.4. NASA will seek to conclude an agreement with the mission sponsor in advance of launch to ensure that this activity will be done.

In those cases where it is proposed to purchase data or to receive data from the parent mission in return for service as a Co-I, the proposal must provide evidence that such data, as delivered, will be suitable for successful completion of the proposed investigation. These data must also be delivered to the PDS for use by the scientific community at large. Such data-buy MO investigations need not specify a performance floor nor provide for a PSP, DAP, or GO.

5.12.6 Funding Policies

Selection of an MO investigation may result in a contract, a grant, or a cooperative agreement, depending on the nature of the proposal and the institutions involved. Further information on grants and cooperative agreements is contained in NASA Handbook NPR 5800.1D, entitled *Grants and Cooperative Agreements Handbook*, available in the DPL.

As a matter of NASA policy, its sponsorship of an MO investigation is always conducted on a no-exchange-of-funds basis with a non-U.S. mission sponsor, although depending on circumstances, NASA may agree to pay for some level of the integration costs for NASA sponsored experiment hardware. Under no circumstances will NASA pay for non-U.S. launch costs.

For an MO investigation on a U.S. commercial mission or on a U.S. Government mission not sponsored by OSS, the PI may receive NASA funding for costs that include integration as well as launch services and will be responsible for payment of these costs.

5.12.7 NASA OSS Cost Requirements and Cost Cap

The NASA OSS Cost for an MO investigation, including any DSMS support or NAIF services, may not exceed $35M (FY 2004 dollars) for all phases of the investigation. Specific cost information required for proposals is contained in Appendix B. NASA's funding for a selected investigation's Concept Study (if required; see Section 5.12.1) will be limited to $250K (RY dollars) and must be budgeted as a part of the initial proposal.

It is important for proposers to this program to understand that the MO PI assumes all risk for delays in implementation of the parent mission and must, therefore, propose appropriate reserves for such contingencies. Following the completion of any Concept Study, but prior to final selection by the parent mission's sponsoring organization, NASA funding for additional work will be limited to $100K (in RY dollars). In any case, NASA funding for all studies prior to the initiation of mission's detailed design (Phase C) will be limited to 25 percent of the total NASA commitment for the requested investigation.

Note that funding for MO investigations must include provisions for the planning and implementation of an appropriate E/PO program in accordance with OSS policies and guidelines.

Should a Concept Study be funded for an MO proposal, the NASA OSS Cost shall not increase by more than 20 percent from that offered in the original proposal to this AO and, in any case, must not exceed the NASA OSS Cost cap for Discovery MO investigations. Thereafter, the cost shall not increase from that offered in the proposal resulting from the Concept Study.

5.12.8 Schedule

It is incumbent on the proposing investigator to provide evidence in his/her proposal that the sponsoring organization intends to fund the parent mission and that the endorsement of NASA for U.S. MO participation is <u>required</u> by the sponsoring organization prior to December 31, 2005. The launch date must not be later than December 31, 2009, in order to allow NASA's planning for the future Discovery Program to proceed in an orderly manner. If a commitment from NASA is not needed by the organization sponsoring the parent mission before December 31, 2005, the proposal should be submitted in response to a future OSS SSE or ASO AO that allows for MO investigations.

6.0 Proposal Submission Information

6.1 Preproposal Activities

6.1.1 Discovery Program Library and Acquisition Home Page

The DPL contents as listed in Appendix D provide additional background, technical and management information, and requirements, including information on the Discovery Program, SSE science goals, the NASA 2003 Strategic Plan, launch vehicles, DSMS capabilities, the OSS Integrated Technology Strategy, the OSS E/PO Strategy and its implementation, the PDS, and existing NASA test and mission operations facilities. In many cases, information provided in these reference documents includes examples of those types of data that may assist evaluators in better evaluating proposals and, therefore, are in the proposer's best interests to provide in their proposals to the best of their ability. In any case of conflict between this AO and these documents, however, the AO takes precedence. All documents in this library may be downloaded through the World Wide Web at the URL (*http://discovery.larc.nasa.gov/discovery/DPL.html*). Hard copies are not available and should not be requested.

A Discovery Acquisition Home Page available on the World Wide Web at the URL (*http://discovery.larc.nasa.gov/discovery/*) will provide updates as may occur up to the date proposals are due to this AO. This Web site will include information about the Preproposal Conference, a list of potential proposers subject to the conditions given in Section 6.1.3, responses to frequently asked questions, and a link to the DPL.

6.1.2 Preproposal Conference

A Preproposal Conference will be held on the date shown in Section 8.0 at the following location:

Renaissance Hotel
999 9th Street, NW.
Washington, D.C. 20001
Telephone: (202) 898-9000

All interested parties may attend but shall not use NASA funds provided under a current grant, agreement, or contract to defray the costs of attendance and must make their own travel arrangements. The purpose of this conference will be to address questions about the proposal process for this AO. Questions should be sent to the Discovery Program Scientist at the address given in Section 6.2. NASA personnel will address all questions that have been received no later than five working days prior to the Conference. Questions submitted after this date may be addressed at the Conference as time permits and as appropriate answers can be generated. Anonymity of the authors of all questions will be preserved. A summary of the Discovery AO Preproposal Conference, including

answers to all questions addressed at the conference, will be posted as part of the DPL (see Section 6.1.1) approximately two weeks after this event.

6.1.3 Notice of Intent to Propose

To assist the planning of the proposal evaluation process, NASA encourages the submission of a Notice of Intent (NOI) to propose by all prospective proposers in accordance with the schedule in Section 8.0. Material in an NOI is confidential and will be used for NASA planning purposes only. Those submitting an NOI will receive any Discovery Program updates as may occur, up to the time of the proposal due date (all updates will also be posted on the Web site of this AO, listed in 6.1.1).

An NOI is submitted electronically by entering the requested information on the site at the URL http://proposals.hq.nasa.gov/. Proposers who experience difficulty in using this site should contact the Help Desk by E-mail at proposals@hq.nasa.gov for assistance. This Web site will request the following information (to the extent that it is known by the NOI due date):

(a) Name, address, telephone number, fax number, E-mail address, and institutional affiliation of the PI.

(b) Full names and institutional affiliations of each known Co-I. If any Co-Is or other team members are from non-U.S. institutions, the mechanism by which these people expect to be funded should be identified in the comments box on the NOI form.

(c) Type of proposal (Discovery Mission investigation or Discovery MO investigation) and anticipated launch vehicle.

(d) A brief statement (150 words or less) for each of the following:
  (i) the scientific objectives of the proposed mission;
  (ii) identification of new technologies that may be employed as part of the mission; and
  (iii) the E/PO objectives in the proposed investigation.

(e) The name of the Lead Representative from each organization (industrial, academic, nonprofit, and/or Federal) included in the proposing team as may be known by the end of the NOI.

SPECIAL NOTICE: As a result of recent AOs for complete mission investigations such as this one, commercial aerospace and technology organizations have requested access to the names and addresses of those who submit NOIs in order to facilitate informing potential proposers of their services and/or products. Therefore, with the permission of the submitters of an NOI to this AO, NASA OSS is willing to make this information publicly available with the understanding that the Agency takes no

responsibility for the subsequent use of such information. The Web site that requests NOI information allows proposers to check a box that grants this permission.

6.2 Point of Contact for Further Information

Inquiries about this AO and/or the Discovery Program may be directed to the Discovery Program Scientist at the following address:

Dr. Susan M. Niebur
Solar System Exploration Division
Office of Space Science
Code SE
National Aeronautics and Space Administration
Washington, DC 20546-0001
Telephone: (202) 358-0745
Fax Number: (202) 358-3097
E-mail: susan.m.niebur@nasa.gov

6.3 Proposal Format

6.3.1 Structure of Proposal

General NASA guidance for proposals to this AO is given in Appendix A, which is considered binding unless specifically amended in this AO. A uniform proposal format is required from all proposers to aid in proposal evaluation, which is summarized in Appendix B. Failure to follow this outline may result in reduced ratings during the evaluation process and could lead to rejection of the proposal without review.

6.3.2 Requirement for PI and Authorizing Institutional Signatures

All proposals must have a Cover Page that includes a Proposal Summary that is to be submitted electronically through the designated Web site following the instructions given in Appendix B. Once this form is submitted, it must be printed and signed by the PI and an official of the PI's institution who is authorized to certify institutional support and sponsorship of the investigation, including the management and the financial parts of the proposal. Note that the authorizing institutional signature on the printout of the electronically submitted Cover Page also certifies that the proposing institution understands and complies with the three required certifications printed in Appendix E of this AO; therefore, it is not necessary to submit these certifications separately with the proposal.

The proposal must also include a letter of endorsement signed by an institutional official from every organization identified as providing no-exchange-of-funds contributions of hardware, software, facilities, and/or services (including those of Co-Is), that provides evidence that the institution and/or appropriate Government officials are aware of the

proposed investigation, support the proposed investigation, and that sufficient funds will be made available to undertake the activity if selected by NASA.

Signatures of commitment are required for all science team members identified in the science section (including the PI and Co-Is) and for all key project personnel named elsewhere in the proposal, including key individuals associated with the E/PO activities. These signatures are to be included at the bottom of the resumes required for each of these individuals and/or included on commitment letters from their institutions (see Appendix B, Section J.2 and J.3). The original, signed documents are to be included in the original copy of the proposal.

Non-U.S. organizations involved in proposals must submit such endorsements to the address given in Section 6.3.4 by the due date given in Section 8.0. Ideally, such letters should be included with the proposal, but if submitted separately, they must clearly identify the proposal by name of the PI and name of the investigation.

6.3.3 Number of Copies of Proposal to be Submitted

The original signed proposal, fifty (50) paper copies, and fifty (50) clearly labeled CD-ROMs that each contain a single, searchable PDF version of the proposal must be delivered to the address given in Section 6.3.4 on or before the proposal deadline given in Section 8.0.

6.3.4 Address for Submittal of Proposal

All proposals must be received at the following address by the proposal due date given in Section 8.0.

Discovery 2004 AO
Office of Space Science
NASA Peer Review Services
Suite 200
500 E Street, SW
Washington, DC 20024-2760
Tel: (202) 479-9030

NASA will notify the proposers that their proposals have been received. Proposers who have not received this confirmation within two weeks after submittal of their proposals should contact the Discovery Program Scientist at the address given in Section 6.2.

6.4 Special Instructions for Proposals Involving non-U.S. Organizations

See Sections 5.9.3, 5.10, 5.11.8, 5.12, and 8.0 for more information on proposals involving non-U.S. organizations.

7.0 Proposal, Evaluation, Selection, and Implementation

7.1 Evaluation and Selection Process

All proposals will be screened to determine their compliance to the requirements and constraints of this AO (see the Proposal Checklist in Appendix G). Proposals that do not comply may be returned to the proposer without further review. Compliant proposals will be assessed against the criteria specified in Section 7.2 by panels of individuals who are peers of the proposers. Panelists will be instructed to evaluate all proposals independently without comparison. These panels may be augmented through the solicitation of mail reviews, which the panels have the right to accept in whole or in part, or to reject. Proposers should be aware that, during the evaluation and selection process, NASA may request clarification of specific points in a proposal; if so, such a request from NASA and the proposer's response shall be in writing.

An *ad hoc* subcommittee of the Space Science Steering Committee (SSSC; see further below), composed wholly of Civil Servants (some of whom may be from Government agencies other than NASA) and appointed by the Associate Administrator for Space Science, will convene to consider the peer review results and categorize the proposals in accordance with procedures required by NASA FAR Supplement Part 1872. The categories are defined as follows:

> Category I. Well conceived and scientifically and technically sound investigations pertinent to the goals of the program and the AOs objectives, and offered by a competent investigator from an institution capable of supplying the necessary support to ensure that any essential flight hardware or other support can be delivered on time, and that data can be properly reduced, analyzed, interpreted, and published in a reasonable time. Investigations in Category I are recommended for acceptance and normally will be displaced only by other Category I investigations.
>
> Category II. Well-conceived and scientifically or technically sound investigations that are recommended for acceptance, but at a lower priority than Category I.
>
> Category III. Scientifically or technically sound investigations that require further development. (Note: in this context, "development" refers to the Technical Readiness Level (TRL) of key proposed hardware; see Section 7.2.4).
>
> Category IV. Proposed investigations which are recommended for rejection for the particular opportunity under consideration, whatever the reason.

The results of the evaluations and categorizations will then be reviewed by a sitting panel of the SSSC. The SSSC will conduct an independent assessment of the evaluation and categorization processes regarding their compliance to established policies and practices,

as well as the completeness, self-consistency, and adequacy of all materials related thereto. After this review, the final evaluation results will be forwarded to the Associate Administrator, who will make the final selection(s). As the Selection Official, the Associate Administrator may consult with senior members of OSS concerning the selections.

Regarding the final selections, proposers should recognize that the Associate Administrator is free to use a wide range of planning and policy considerations when selecting among top-rated proposals. While OSS develops and evaluates its program strategy in close consultation with the scientific community through a wide variety of advisory groups, the OSS program is an evolving activity that ultimately depends upon the most current Administration policies and budgets, as well as the scientific priorities identified by the scientific community.

The overriding consideration for the final selection of proposals submitted in response to this AO will be to maximize scientific return within the available budget for this program. Depending on the availability of proposals of appropriate merit, this objective may be achieved by the selection of an investigation at the cost ceiling for Discovery Mission investigations, an investigation significantly below the cost ceiling that would allow a more rapid release of the next Discovery AO, or a combination of investigations of various costs, including any MO investigations.

7.2 Evaluation Criteria

7.2.1 Overview

The criteria below will be used to evaluate proposals as described in Section 7.1. For a Discovery MO investigation, the proposed investigation is understood to encompass only the proposed contribution to the mission and not that of the entire parent mission. The evaluation criteria with their approximate percentage weights (the first percentage is for Discovery Mission investigations and MO investigations with hardware; the second is for MO data-buy only investigations), are as follows:

- The scientific merit of the proposed investigation; 40 / 60
- The technical merit and feasibility of the proposed investigation; and 30 / 40
- The feasibility of the proposed approach for mission implementation, including cost risk (*i.e.*, realism and reasonableness of cost), and subcontracting plans. 30 / 0

These criteria are defined more fully in the following sections. Evaluation findings for each criterion will be documented using narrative text in terms of specific Major and Minor Strengths and Weaknesses, as well as an adjectival summary score: Excellent, Very Good, Good, Fair, or Poor, as defined in the table below.

Summary Evaluation	Basis for Summary Evaluation
Excellent	A comprehensive, thorough, and compelling proposal of exceptional merit that fully responds to the objectives of the AO as documented by numerous and/or significant strengths and having no major weaknesses.
Very Good	A fully competent proposal of very high merit that fully responds to the objectives of the AO, whose strengths fully outbalance any minor weaknesses and that has no major weaknesses.
Good	A competent proposal that rep-resents a credible response to the AO, having neither significant strengths nor weakness and whose minor strengths and weaknesses essentially balance.
Fair	A proposal that provides a nominal response to the AO but whose weaknesses outweigh any perceived strengths.
Poor	A seriously flawed proposal having one or more major weaknesses (e.g., an inadequate or flawed plan of research, or lack of focus on the objectives of the AO).

7.2.2 Scientific Merit of the Proposed Investigation

The description of the scientific investigation provided in the proposal will be used to evaluate its scientific merit in terms of specific major and minor strengths and weaknesses. The investigation's goals and objectives will be compared with the broad strategic goals of the NASA OSS SSE and the search for extrasolar planet systems element of the ASO, as defined in the NASA 2003 Strategic Plan, Appendix III (in the DPL). This evaluation will also include consideration of how well the investigation promises fundamental progress in the scientific knowledge of the target, how well the investigation may support NASA's other SSE missions, and whether it provides ancillary benefits to NASA's space science program in general (e.g., through development of critical new technologies). For Discovery Mission investigations, the scientific value of the Performance Floor (see Section 5.11.3) will also be assessed as part of the determination of the overall scientific merit of the investigation. This evaluation will result in narrative text, as well as an appropriate adjectival rating.

7.2.3 Technical Merit and Feasibility of the Proposed Investigation

Each investigation will be evaluated for its technical merit, feasibility, resiliency, and the probability of success as expressed in terms of specific major and minor Strengths and Weaknesses. Technical merit and feasibility will be evaluated by assessing the degree to which the investigation will address the proposed scientific goals and objectives, and the

degree to which any proposed instruments can provide the necessary data. Considerations in the evaluation of the data analysis (*i.e.*, calibration/validation) and archiving plan will include an assessment of planning and budget adequacy and evidence of plans for well documented, high level products and software usable to the entire science community, and consideration of adequate resources for physical interpretation of data and reporting scientific results in refereed journals. Consideration of whether the data gathered will be sufficient to complete the scientific investigation will be a major factor in this assessment, as will the proposed plan for the timely release of the data to the public domain for enlarging its science impact. For Discovery Mission investigations, resiliency will be evaluated by assessing the approach to descoping the Baseline Mission to the Performance Floor in the event that development problems force reductions in scope. The probability of success will be evaluated by assessing the experience, expertise, and organizational structure of the science team and the mission design in light of any proposed instruments. The role of each Co-I will also be evaluated for necessary contributions to the proposed investigation; the inclusion of Co-Is who do not have a well-defined role will be considered a weakness of the proposal. This evaluation will result in narrative text, as well as an appropriate adjectival rating.

MO investigations that do not include hardware (e.g., data purchase or data exchange for services as a Co-I) will be evaluated against all the factors above except that the non-NASA provided flight instrument design(s) will not be evaluated for its (their) ability to provide the necessary data. However, such proposals will be evaluated for the evidence that such data will be made available by way of signed commitments for their delivery in a format and timeframe suitable for the completion of the proposed investigation. It is assumed that NASA will not pay for these data unless the data, as delivered, are suitable for successful completion of the proposed investigation. In addition, MO investigations that do not include hardware need not specify a performance floor, nor provide for a PSP, DAP, and/or GO (as defined in Section 5.2.5).

7.2.4 Feasibility of the Proposed Approach for Mission Implementation Including Cost Risk

The technical and management approaches of all submitted investigations will be evaluated to assess the likelihood that they can be implemented as proposed, including an assessment of the risk of their completion within the proposed costs. The evaluation will consider implementation factors such as the proposed launch vehicle including reliability, overall mission design (i.e., “mission architecture”), spacecraft design and design margins, use of the DSMS, and the proposers' understanding of the processes, products, and activities required to accomplish development and integration of all elements (flight systems, ground and data systems, etc.). This assessment will also consider the adequacy of the proposed organizational structure, the roles and experience of the known partners, the management approach, the commitments of partners and contributors, and the team’s understanding of the scope of work (covering all elements of the mission, including contributions). The relationship of the work to the project schedule, the project element interdependencies, and associated schedule margins will also be evaluated.

Investigations proposing new technology, i.e., technologies having a Technology Readiness Level (TRL) less than 7 (see TRL Definitions in the DPL), will be penalized for risk if adequate backup plans to ensure success of the mission are not described. The proposal must discuss the methods and rationale (cost models, cost estimating relationships of analogous missions, *etc.*) used to develop the estimated cost, and must include a discussion of cost risks. Innovative cost effective features, processes, or approaches will be considered a strength if proven sound. However, even with innovative cost features, proposals that are unable to show an unencumbered reserve at confirmation (i.e., at the end of Phase B) of at least 25 percent of all development costs (excluding ELV) are likely to be judged a high cost risk and not selected. This evaluation will result in narrative text, as well as an appropriate adjectival rating.

Proposals must also define the risk management approach the project team intends to use to ensure successful achievement of the investigation objectives within established resource and schedule constraints. Risk mitigation plans for new technologies, and the need for long-lead items that must be placed on contract before the beginning of Phase C to ensure timely delivery should be included in this discussion of risk management. Additionally, any manufacturing, test, or other facilities needed to ensure successful completion of the proposed investigation should be identified in the proposal.

Proposals must also identify a PM who will oversee the technical and managerial implementation of the project. The PM must work closely with the PI in order to ensure that the mission meets its objectives within the resources outlined in the proposal. The role, qualifications, and experience of the PM must be adequate to ensure that the technical and managerial needs of the investigation will be met.

Proposed subcontracting plans and SDB participation targets for Discovery investigations will be evaluated.

The commitment of every partner, U.S. or non-U.S., offering a contribution must be documented in letters of endorsement. For proposals offering contributions that are critical to the success of the proposed investigation, the evaluated risk will increase if the proposals: 1) do not have clear and simple technical and management interfaces in the proposed cooperative arrangements, 2) do not provide evidence in the proposal that the contribution is within the scientific and technical capability of the partner, and 3) do not have the required endorsement on a firm commitment to provide the offered contribution. Adequate contingency plans for coping with the failure of a proposed cooperative arrangement may help to reduce the evaluated risk.

Since MO investigations fly on non-OSS missions, factors involving spacecraft and launch vehicle capabilities will be considered in the evaluation only as appropriate. MO investigations that do not provide hardware (*e.g.,* data buys or exchange for Co-I services) will not be evaluated under this criterion.

For both Mission and MO investigations, technical, management, and cost evaluation will include an assessment of proposed planetary protection provisions to avoid potential biological contamination (forward and backward) that may be associated with the mission.

7.3 Plans for Implementation

7.3.1 Notification of Selection

Following selection, the PIs of the selected investigations will be notified immediately by telephone followed by formal written notification, which may include any special conditions or terms of the offer of selection (e.g., partial selections, see Section II of Appendix A). The formal notification will also include instructions for scheduling a debriefing at which any issues noted during the evaluation that may require attention during the Phase A Concept Study will be discussed (see Section 7.3.3). In addition, any other special instructions for the Concept Study will be communicated.

7.3.2 Contract Administration and Funding

Unique mission management approaches and organizational arrangements in the selected proposals may require different contract administration and funding arrangements. Therefore, each PI should specify the proposed teaming arrangement in his/her proposal, including any special contracting mechanisms that are considered especially desirable for NASA's award to the team. In this regard, NASA strongly encourages cost-type contracts with incentives, particularly where performance incentives are measured based on delivery of calibrated/validated science data products.

It is anticipated that NASA will provide up to $1M to each selected Discovery Mission investigation and up to $250K for each MO investigation (if applicable; see Section 5.1) to perform a Phase A Concept Study to be initiated as soon as possible after notification.

Please note that all awards resulting from this AO will be made as subcontracts under the NASA prime contract for JPL, as part of the JPL Discovery and New Frontiers Program Management Office.

7.3.3 Confirmation of Investigations for Implementation

The product of the Phase A studies will be Concept Study reports as specified in the document entitled *Guidelines and Criteria for the Phase A Concept Study* in the DPL. The scientific, technical, management, cost, and other aspects of the Concept Study will be assessed according to the criteria contained in this document by a panel composed of individuals who are experts in each of the areas to be evaluated. Past performance of the partners in the implementation of previous or current space missions, particularly cost capped missions such as NASA's Explorer or Discovery missions, will be one of the factors used in assessing cost risk, schedule risk, and the risk of failure in technical

performance. This assessment of the Concept Study will be similar to the proposal evaluation, but will consider the additional detailed information provided. However, in this case, NASA may request in-person presentations and/or site visits to review the Phase A Concept Study with the investigation teams. However, even with innovative cost features, selected investigations that are unable to show an unencumbered reserve at the time of their confirmation for development (i.e., at the end of Phase B) of at least 25 percent of all development costs in Phases C and D (excluding ELV) are likely to be judged as having an unacceptably high cost risk and, therefore, not confirmed for further development.

If any change in scientific scope is introduced as a result of the Concept Study, this evaluation will include a reexamination of the scientific merit of the investigation. In all cases, the total cost to NASA, the technical merit and feasibility of the science investigation, and the feasibility of implementing the mission will be evaluated. A complete assessment of the technical approach, the management, the Phase B plans, and the cost risk will be integrated to evaluate the probability that the implementation approach will support the science objectives. In addition, there will be a detailed evaluation of plans and provisions for E/PO and Small Business and Minority Institutions developed as part of the Phase A Concept Study.

As a result of the evaluation of the Concept Studies, the Associate Administrator for Space Science expects to authorize one or more Discovery mission investigations to proceed to Phase B through the exercise of an option under that team's existing contract with NASA. NASA will not continue funding for investigations that are not authorized to proceed; any such investigations are free to repropose to future suitable AOs. Any MO investigations as may have been selected for Phase A study may or may not be confirmed for implementation.

MOs may or may not have a Phase A based on their perceived readiness to proceed.

7.3.4 Confirmation of Investigations for Phases Subsequent to Phase A

At the completion of the Phase B study (*i.e.*, after the Preliminary Design Review (PDR)) for the selected and confirmed investigation, an independent review team, chartered by the Associate Administrator for Space Science, will conduct a Confirmation Assessment, the results of which will be presented to the Associate Administrator in a formal Confirmation Review in compliance with OSS policy application of the NPR 7120.5B Approval process. The organization designated by NASA to implement the investigation may also choose to hold a Confirmation Readiness Review prior to the Confirmation Review. The PI, the independent review team Chairperson, and a representative of the implementing organization will present results of these reviews to the Associate Administrator for Space Science at the Confirmation Review, who will then decide whether or not to confirm the mission(s) for implementation (Phases C and D). This decision will be based on the project's readiness to proceed to design and development and programmatic considerations such as cost, schedule, the ability to achieve the

scientific objectives delineated in the proposal, and the completeness of the project's Level I requirements. Missions not confirmed for implementation may be sent back for additional study or may be terminated. NASA will not expend additional funds on nonconfirmed and terminated missions. Once the Associate Administrator for Space Science has confirmed a mission for implementation, no subsequent rephasing of funds from Phase E into earlier Phases C and D will be permitted.

7.4 Opportunity for Debriefing of Nonselected Proposers

Proposers of investigations that are not selected will be notified in writing and offered oral debriefings for themselves and a representative from each of their main partners (if any). Such debriefings may be in person at NASA Headquarters or by telephone if the investigation team prefers. In the former case, proposers may not use NASA funds derived from an OSS research award to defray travel costs. In either case, a senior representative from the key institution(s) involved in a proposal may participate in such debriefings in addition to the proposing PI.

8.0 Schedule of Solicitation

The following schedule describes the major milestones for this Discovery AO:

Notice of Intent to Release an AO issued …….. January 15, 2004
Federal Business Opportunities synopsis issued…….....March 23, 2004
AO release.....April 16, 2004
Preproposal Conference …….. .....April 23, 2004
Notice of Intent due.....May 14, 2004
Proposal deadline, 4:30 p.m. ET.....July 16, 2004
Non-U.S. Letter of Endorsement due (with proposal)…… July 16, 2004
Selections announced (target)……...January 16, 2005
Concept Study kickoff …… February 16, 2005
Concept Study due (target).……. August 16, 2005
Downselect (target) ……..November 16, 2005
Confirmation for flight (target)……..…August 16, 2006
Launch (NLT) ……..December 31, 2009

9.0 Conclusion

The Discovery Program continues to represent a challenging way for NASA to accomplish important scientific exploration of planets. It provides an opportunity for frequent flights to execute science investigations at the forefront of planetary science, as well as generate opportunities to enhance education initiatives and engage the public in the excitement of science discoveries. NASA invites both the U.S. and international science communities to participate in proposals for Discovery mission investigations and MO investigations to be carried out as a result of this Announcement.

Orlando Figueroa
Director
Solar System Exploration Division

Anne L. Kinney
Director
Astronomy and Physics Division

Edward J. Weiler
Associate Administrator
for Space Science

APPENDIX A

GENERAL INSTRUCTIONS AND PROVISIONS

I. Instrumentation and/or Ground Equipment

By submitting a proposal, the investigator and institution agree that NASA has the option to accept all or part of the offeror's plan to provide the instrumentation or ground support equipment required for the investigation or NASA may furnish or obtain such instrumentation or equipment from any other source as determined by the selecting official. In addition, NASA reserves the right to require use, by the selected investigator, of Government instrumentation or property that becomes available, with or without modification, that will meet the investigative objectives.

II. Tentative Selections, Phased Development, Partial Selections, and Participation with Others

By submitting a proposal, the investigator and the organization agree that NASA has the option to make a tentative selection pending a successful feasibility or definition effort. NASA has the option to contract in phases for a proposed experiment, and to discontinue the investigative effort at the completion of any phase. The investigator should also understand that NASA may desire to select only a portion of the proposed investigation and/or that NASA may desire the individual's participation with other investigators in a joint investigation, in which case the investigator will be given the opportunity to accept or decline such partial acceptance or participation with other investigators prior to a selection. Where participation with other investigators as a team is agreed to, one of the team members will normally be designated as its team leader or contact point.

III. Selection Without Discussion

The Government reserves the right to reject any or all proposals received in response to this AO when such action shall be considered in the best interest of the Government. Notice is also given of the possibility that any selection may be made without discussion (other than discussions conducted for the purpose of minor clarification). It is therefore emphasized that all proposals should be submitted initially on the most favorable terms that the offeror can submit.

IV. Foreign Proposals

The following guidelines are established for foreign responses to NASA's AO. Unless otherwise indicated in a specific announcement, these guidelines indicate the appropriate measures to be taken by foreign proposers, prospective foreign sponsoring agencies, and NASA leading to the selection of a proposal and execution of appropriate arrangements. They include the following:

(i) Where a "Notice of Intent" to propose is requested, prospective foreign proposers should write directly to the NASA official designated in the AO.

(ii) Unless otherwise indicated in the AO, proposals will be submitted in accordance with this Appendix. Proposals should be typewritten and written in English. Foreign entities are generally not eligible for funding from NASA. Therefore, proposals from foreign entities should not include a cost plan unless the proposal involves collaboration with a U.S. institution, in which case a cost plan for only the participation of the U.S. entity must be included (unless otherwise noted in the AO).

(iii) Persons planning to submit a proposal should arrange with an appropriate foreign governmental agency for a review and endorsement of the proposed activity. Such endorsement by a foreign organization indicates that the proposal merits careful consideration by NASA and that, if the proposal is selected, sufficient funds will be available to undertake the activity envisioned.

(iv) Proposals including the requested number of copies and letters of endorsement from the foreign governmental agency must be forwarded to NASA in time to arrive before the deadline established for each AO.

(v) Those proposals received after the closing date will be treated in accordance with NASA's provisions for late proposals. Sponsoring foreign government agencies may, in exceptional situations, forward a proposal directly to the above address if review and endorsement is not possible before the announced closing date. In such cases, NASA should be advised when a decision on endorsement can be expected.

(vi) Shortly after the deadline for each AO, the Program Office will advise the appropriate sponsoring agency which proposals have been received and when the selection process should be completed. A copy of this acknowledgment will be provided to each proposer.

(vii) Successful and unsuccessful proposers will be contacted directly by the NASA Program Office coordinating the AO. Copies of these letters will be sent to the sponsoring Government agency.

(viii) NASA's Office of External Relations will then begin making the arrangements to provide for the selectee's participation in the appropriate NASA program. Depending on the nature and extent of the proposed cooperation, these arrangements may entail:

(A) An exchange of letters between NASA and the sponsoring foreign governmental agency.

(B) An agreement or Memorandum of Understanding between NASA and the sponsoring foreign governmental agency.

V. Treatment of Proposal Data

It is NASA policy to use information contained in proposals and quotations for evaluation purposes only. While this policy does not require that the proposal or quotation bear a restrictive notice, offerors or quoters should place the following notice on the title page of the proposal or quotation and specify the information, subject to the notice by inserting appropriate identification, such as page numbers, in the notice. Information (data) contained in proposals and quotations will be protected to the extent permitted by law, but NASA assumes no liability for use and disclosure of information not made subject to the

notice. To prevent inadvertant disclosure, proposal data shall not be included in submissions (e.g. final reports) that are routinely released to the public.

RESTRICTION ON USE AND DISCLOSURE OF PROPOSAL AND QUOTATION INFORMATION (DATA)

The information (data) contained in [insert page numbers or other identification] of this proposal or quotation constitutes a trade secret and/or information that is commercial or financial and confidential or privileged. It is furnished to the Government in confidence with the understanding that it will not, without permission of the offeror, be used or disclosed for other than evaluation purposes; provided, however, that in the event a contract is awarded on the basis of this proposal or quotation the Government shall have the right to use and disclose this information (data) to the extent provided in the contract. This restriction does not limit the Government's right to use or disclose this information (data) if obtained from another source without restriction.

VI. Status of Cost Proposals (U.S. Proposals Only)

The investigator's institution agrees that the cost proposal is for proposal evaluation and selection purposes, and that following selection and during negotiations leading to a definitive contract, the institution may be required to resubmit cost information in accordance with **FAR 15.403-5**.

VII. Late Proposals

Proposals or proposal modifications received after the latest date specified for receipt may be considered if a significant reduction in cost to the Government is probable or if there are significant technical advantages, as compared with proposals previously received.

VIII. Source of Space Transportation System Investigations

Investigators are advised that candidate investigations for Space Transportation System (STS) missions can come from many sources.

IX. Disclosure of Proposals Outside Government

NASA may find it necessary to obtain proposal evaluation assistance outside the Government. Where NASA determines it is necessary to disclose a proposal outside the Government for evaluation purposes, arrangements will be made with the evaluator for appropriate handling of the proposal information. Therefore, by submitting a proposal the investigator and institution agree that NASA may have the proposal evaluated outside the Government. If the investigator or institution desire to preclude NASA from using an outside evaluation, the investigator or institution should so indicate on the cover. However,

notice is given that if NASA is precluded from using outside evaluation, it may be unable to consider the proposal.

X. Equal Opportunity (U.S. Proposals Only)

By submitting a proposal, the investigator and institution agree to accept the following clause in any resulting contract:

EQUAL OPPORTUNITY

During the performance of this contract, the Contractor agrees as follows:

(a) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin.

(b) The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, or national origin. This shall include, but not be limited to, (1) employment, (2) upgrading, (3) demotion, (4) transfer, (5) recruitment or recruitment advertising, (6) layoff or termination, (7) rates of pay or other forms of compensation, and (8) selection for training, including apprenticeship.

(c) The Contractor shall post in conspicuous places available to employees and applicants for employment the notices to be provided by the Contracting Officer that explain this clause.

(d) The Contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

(e) The Contractor shall send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding the notice to be provided by the Contracting Officer, advising the labor union or workers' representative of the Contractor's commitments under this clause, and post copies of the notice in conspicuous places available to employees and applicants for employment.

(f) The Contractor shall comply with Executive Order 11246, as amended, and the rules, regulations, and orders of the Secretary of Labor.

(g) The Contractor shall furnish to the contracting agency all information required by Executive Order 11246, as amended, and by the rules, regulations, and orders of the Secretary of Labor. Standard Form 100 (EEO-1), or any successor form, is the prescribed form to be filed within 30 days following the award, unless filed within 12 months preceding the date of award.

(h) The Contractor shall permit access to its books, records, and accounts by the contracting agency or the Office of Federal Contract Compliance Programs (OFCCP) for the purposes of investigation to ascertain the Contractor's compliance with the applicable rules, regulations, and orders.

(i) If the OFCCP determines that the Contractor is not in compliance with this clause or any rule, regulation, or order of the Secretary of Labor, the contract may be canceled, terminated, or suspended in whole or in part, and the Contractor may be declared ineligible for further Government contracts, under the procedures authorized in Executive

Order 11246, as amended. In addition, sanctions may be imposed and remedies invoked against the Contractor as provided in Executive Order 11246, as amended, the rules, regulations, and orders of the Secretary of Labor, or as otherwise provided by law.

(j) The Contractor shall include the terms and conditions of subparagraph l through 9 of this clause in every subcontract or purchase order that is not exempted by the rules, regulations, or orders of the Secretary of Labor issued under Executive Order 11246, as amended, so that these terms and conditions will be binding upon each subcontractor or vendor.

(k) The Contractor shall take such action with respect to any subcontract or purchase order as the contracting agency may direct as means of enforcing these terms and conditions, including sanctions for non-compliance; provided, that if the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of direction, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

XI. Patent Rights

(a) For any contract resulting from this solicitation awarded to other than a small business firm or nonprofit organization, the clause at 1852.227-70, "New Technology," shall apply. Such contractors may, in advance of contract, request waiver of rights as set forth in the provision at 1852.227-71, "Requests for Waiver of Rights to Inventions."

(b) For any contract resulting from this solicitation awarded to a small business firm or nonprofit organization, the clause at **FAR 52.227-11**, "Patent Rights--Retention by the Contractor (Short Form)" (as modified by 1852.227-11), shall apply.

XII. Rights in Data

Any contract resulting from this solicitation will contain the Rights in Data – General clause: FAR 52.227-14.

XIII. Small and Small Disadvantaged Business Subcontracting

A. Offerors are advised that, in keeping with Congressionally mandated goals, NASA seeks to place a fair portion of its contract dollars, where feasible, with small, small disadvantaged, women-owned small business concerns, and Historically Black Colleges and Universities (HBCUs), and other minority educational institutions, as these entities are defined in FAR 52.219-8 and 52.226-2.

B. Section 8(d) of the Small Business Act requires insertion of the clause at FAR 52.219-9, Small Business Subcontracting Plan, in NASA contracts that offer subcontracting possibilities, exceed $500,000, and are with organizations other than small Business Concerns. Offerors seeking Concept Study Phase contracts that meet these criteria must include subcontracting plans as part of their proposals for this phase. The subcontracting plans will be evaluated on the participation goals and quality and level of work performed by small business

concerns, HBCUs, and other minority educational institutions. Offerors will also be evaluated on proposed participation targets of small business concerns (SDBs) in the applicable North American Industry Classification System (NAICS) Sub sector as determined by the Department of Commerce (see FAR 19.201(b)).

C. Offerors that are selected for Concept Study Phase contracts will be required to submit new subcontracting plans in conjunction with their Concept Study reports. These plans will reflect subcontracting opportunities anticipated as part of the Implementation Phase contracts. The subcontracting plans and the participation of SDBs in the performance of this phase of the contract will be evaluated in the manner described in Paragraph B above as part of the process of selecting the Implementation Phase contractor.

XIV. Withdrawal of Proposals

Proposals may be withdrawn by the proposer at any time before award. Proposers are requested to notify NASA if the proposal is funded by another organization or of other changed circumstances, which dictate termination of evaluation.

APPENDIX B

GUIDELINES FOR PROPOSAL PREPARATION

The following guidelines apply to the preparation of proposals in response to this Announcement of Opportunity (AO). The material presented is a guide for the prospective proposer and is not intended to be all encompassing. The proposer must, however, provide information relative to those items applicable, as well as other items required by the AO. In the event of an apparent conflict between the guidelines in this Appendix and those contained within the body of the AO, those within the AO shall take precedence.

GENERAL GUIDELINES

All documents must be typewritten in English, use metric and standard astronomical units, and be clearly legible. Submission of any portion of the proposal material by facsimile, electronic media, videotape, or computer disk is not acceptable except as requested below, nor may a proposal reference a World Wide Web site for any data or material necessary for its completeness or review. In evaluating proposals, NASA will only consider the printed material in the submitted proposal.

The proposal must consist of only one volume, with readily identified sections corresponding to Sections D through J in this Appendix. The restrictions on page count for the various sections are specified in the table below. If the same information is required in more than one section of the proposal (*e.g.,* instrument and/or spacecraft design specifications) to support the subject discussion, it may be included by reference to the primary section where it exists provided that such reference does not unduly impede understanding of the presented material.

Fifty CD-ROMs containing a single, searchable PDF file of the proposal must be delivered with 50 printed copies (see Section 6.3.3 of this AO). In order to allow for recycling of proposals after the review process, all proposals and copies must be submitted on plain white paper only (*i.e.*, no cardboard stock or plastic covers, no colored paper, *etc.*). Photographs and color figures are permitted only if printed on recyclable white paper. The original, signed copy of the proposal (including signed endorsements) must be bound in a manner that makes it easy to disassemble for reproduction should NASA need additional copies. Except for the original, two-sided copies are preferred.

Proposals shall comply with the page limitations noted in the table below, including no more than five fold out pages (28 x 43 cm; *i.e.*, 11 x 17 inches), where each fold out page counts as one regular sized page. All pages other than fold out pages shall be 8.5 x 11 inches or A4 European standard. Each side of paper on which text or figures appears is counted as a page.

Single- or double-column printing format is acceptable. In complying with the page limits, the type font should not be smaller than 12 point (*i.e.*, less than or equal to ~15 characters per inch), using no less than 1 inch (2.5 cm) margins at the top, and both sides, and bottom (note: A4 paper should use 2.5 cm at the top and both sides, and 4 cm at the bottom). Figure captions should be in 12-point font, though smaller font is allowed within figures and cost tables (however, all figure information must be easily readable without optical aid).

The following table provides page count limits for proposals for Discovery Mission investigations and MO investigations except that MO proposals are limited to 25 pages for the description of the Science Investigation (Section D) and 15 pages for the description of Mission Implementation, including Advanced Development (Section G), Management and Schedule (Section H), and Cost and Cost Estimating Methodology (Section I). Note that the completed cost table is not counted against the page limit given above. One extra page each is allotted for description of any optional Participating Scientist Program (PSP), Data Analysis Program (DAP), and/or Guest Observer (GO) Program.

Section	**Mission Investigation Page Limit**	**MO Page Limit**
A. Cover Page and Proposal Summary	Printout of electronic Web submission	
B. Table of Contents	2	
C. Fact Sheet	2	
D. Science Investigation	30	25
E. Plans for Participating Scientist Program, Data Analysis Program, and/or Guest Observer Program (optional)	1 page per program	
F. Plan for Education and Public Outreach and Small Disadvantaged Businesses	2	
G. Mission Implementation including Advanced Development H. Management and Schedule I. Cost and Cost Estimating Methodology (completed cost table not counted against the page limit)	20 total (plus 5 pages if development of advanced technologies is proposed)	15

J. Appendices: (no others permitted) 1. Statement(s) of Work (SOW) and Funding Information for each contract 2. Letter(s) of Endorsement (including foreign participants) 3. Summary of Proposed Cooperative Contributions 4. Resumes of Key Participants (2 pages each, maximum) 5. Discussion on Compliance with U.S. Export Laws and Regulations 6. Outline of Technical Responsibilities Between U.S. and International Partners 7. Compliance with Planetary Protection Requirements 8. Compliance with Procurement Regulations by NASA PI (if applicable) 9. Acronyms and Abbreviations 10. References	No page limit, but small size encouraged

A. COVER PAGE AND PROPOSAL SUMMARY

A Cover Page and Proposal Summary, prepared as directed below, must preface the proposal. The Principal Investigator (PI) and an official of the proposing organization who is authorized to commit the organization's resources to the proposed investigation must sign the Cover Page. This authorizing signature also certifies that the proposing institution has read and is in compliance with the three required certifications printed in full in Appendix E; therefore, these certifications do not need to be submitted separately.

The form for the Cover Page and Proposal Summary is found at the Web site located at http://proposals.hq.nasa.gov; it must be completed and submitted online. The full names of the PI and the authorizing official, their addresses with zip code, telephone and fax numbers, and electronic mail addresses are required on the specified form, as well as the names, institutions, and E-mail addresses of all participants, the type of investigation proposed (*i.e.*, Mission or MO), the total NASA OSS Cost, and a 200-word Proposal Summary. A hard copy version of this Cover Page/Proposal Summary must be printed in time to acquire signatures and include with the original hard copy and all copies of the proposal for delivery to the address in Section 6.3.4 according to the schedule provided in Section 8.0, both in this AO. Proposers are advised that they must not reformat or correct the printed version of this Cover Page as important NASA-required documentation may be lost. Note that every person whose name is entered on this from must be registered in its database. Each person must do this for himself/herself--the PI cannot do this for his or her Co-Is. Therefore, proposers and their team members are strongly advised to visit this Web site well in advance to ensure that they are properly registered. Proposers who experience difficulty in using this site may contact the Help Desk at proposals@hq.nasa.gov for assistance. Note that electronic submission of the Cover Page does not satisfy the deadline for proposal submission.

It is NASA's intent to enter the Proposal Summaries of all selected investigations for its various programs into a publicly accessible database. Therefore, the Proposal Summary should not contain any proprietary or confidential information that the submitter wishes to protect from public disclosure; in that regard, see also Section V of Appendix A of this AO.

B. TABLE OF CONTENTS

The proposal should contain a Table of Contents that includes the topics provided below in Sections D through J.

C. FACT SHEET

A Fact Sheet that provides a brief summary of the proposed investigation must be included in the proposal. The information conveyed on the Fact Sheet should include the following:

- Science objectives (including the importance of the science to the NASA science themes);
- Education and public outreach objectives;
- Technology development/infusion/transfer objectives;
- Mission overview (including mission objectives and major mission characteristics);
- Science payload;
- Key spacecraft characteristics;
- Anticipated launch vehicle;
- DSMS infrastructure usage;
- Mission management (including teaming arrangement as known);
- Anticipated need for curatorial services for returned samples (as appropriate);
- Schedule of proposed investigation;
- Statement of any anticipated significant contributions to the investigation and an estimate of their value; and
- The estimated Total Cost to NASA from Table B-1.

Other relevant information, including figures or drawings, may be included at the proposer's discretion. The Fact Sheet is restricted to two pages (preferably a single, double-sided sheet).

D. SCIENCE INVESTIGATION

The Science Investigation section should contain the following topics for the proposed investigation.

1. Scientific Goals and Objectives. This section should consist of a discussion of the goals and objectives of the investigation; their value to achieving the science objectives stated in this AO; and their relationships to past, current, and future investigations and missions. Provide the history of the need for such an investigation, including an overview of the proposed mission.

   The measurements to be taken in the course of the investigation, the data to be returned, and the approach that will be taken in analyzing the data to achieve the scientific objectives of the investigation must be discussed. This description should identify the investigation to be performed, the quality of the data to be returned (*e.g.,* resolution, coverage, pointing accuracy, measurement precision, *etc.*), and the quantity of data to be returned (bits, images, *etc.*). The relationship between the data products generated and the scientific objectives must be explicitly described, as should the expected results. It is assumed that the above information will constitute the Baseline Mission.

   A single Performance Floor, defined as the minimum acceptable data and scientific return, must be defined for the mission investigation, below which it would not be worth pursuing. The value of an investigation carried out at the level of the Performance Floor must be discussed. A description of the descope options available, their phasing, and their effect on meeting the scientific objectives of the investigation as it is descoped from the Baseline to the Performance Floor must be discussed.

2. Implementation.

a. Instrumentation. This section must describe the proposed instrumentation and the criteria used for its selection. It should identify the individual instruments and instrument systems, including their characteristics and requirements, and indicate items that are proposed to be developed, as well as any existing instrumentation or design/flight heritage. The quality and quantity of data generated by each instrument, as they relate to the stated science investigation goals and objectives, must be discussed. The flow-down from science investigation goals to measurement objectives and instrument performance must be stated clearly and supported by quantitative analysis where possible.

   A preliminary description of each instrument design with at least a block diagram showing the instrument systems and their interfaces must be included, along with a presentation of the estimated performance of the instrument. These performance characteristics (which shall be considered as requirements on the flight system)

must include mass, power, volume, data rate(s), pointing, and pointing accuracy, as well as resolution, precision/sensitivity, and calibration requirements.

b. Mission. The science payload observing profile must be discussed, including all mission-relevant parameters, such as orbit and/or surface location, pointing requirements, operational time lines (including observing periods, data transmission periods and techniques, and time-critical events), *etc.* The manner in which the stated investigation objectives and selected instruments drive the proposed mission design and operations plan should be apparent from this discussion.

c. Data Analysis and Archiving. The data reduction and analysis activities after the data have been delivered to the ground must be discussed, including the method and format for data reduction, data validation, and preliminary analysis. The process by which data will be prepared for archiving must be discussed, including a list of the specific data products to be produced and the individual team members responsible for this activity. The plan must include a detailed schedule for the earliest possible submission of raw and reduced data to the NASA Planetary Data System (PDS) in the proper formats, media, *etc.*

d. Science Team. This section must identify every individual that is considered necessary for the investigation science team and his or her roles and responsibilities. The capabilities and experience of all members of the proposed science team must be described (see Section J.3 below). The role of each Co-Investigator (Co-I) must be explicitly defined and justified, and the funding source (NASA or contributed) for the PI and each Co-Investigator noted. If a Co-Investigator's services are contributed at no cost to the investigation, a letter of endorsement is required from that Co-Is institution (see Section J.2 below).

E. PLAN FOR PARTICIPATING SCIENTIST PROGRAM, DATA ANALYSIS PROGRAM, AND/OR GUEST OBSERVER PROGRAM (OPTIONAL)

OSS policy encourages the addition of Participating Scientist Programs (PSPs) and Data Analysis Programs (DAPs) to broaden the scientific impact of missions. Guest Observer (GO) Programs are also encouraged, where appropriate. Investigations should include adequately funded PSPs, DAPs, and/or GOs where these are appropriate. These programs are usually initiated no earlier than Phase E. Although OSS will independently solicit and administer these programs using competitive peer review, if such a program is proposed, the costs of implementing it must be included in the proposer's estimate of the NASA OSS Cost (Section 5.9.1).

F. PLAN FOR EDUCATION AND PUBLIC OUTREACH (E/PO) AND SMALL DISADVANTAGED BUSINESSES

The proposer must provide a statement that she/he understands NASA OSS requirements for Education and Public Outreach (E/PO) and is committed to carrying out an E/PO program that meets the goals described in Section 5.6 of the AO. The proposer must also provide an overview of the planned E/PO activities and their relationship to the proposed investigation. This overview should include a brief discussion of any unique characteristics of the mission that might provide unusual opportunities for E/PO. The proposer must declare any intention to include any experiment on the spacecraft that will be led by students, particularly pre-college students. Because of the length of the Formulation and Implementation phases of Discovery missions, a student–led experiment should be proposed only if there are compelling circumstances to justify its inclusion. Detailed plans for implementing the E/PO activities, including identification of and formal commitment from E/PO partner institutions, will be part of the Phase A Concept Study and will be evaluated as part of the confirmation process (see Section 7.3.3 of this AO).

As explained in Appendix A, Section XIII of this AO, proposers that are not small business concerns, seek contracts in excess of $500,000, and have subcontracting possibilities must submit subcontracting plans. These proposers must also include participation targets for small disadvantaged business concerns (SDBs) in the applicable North American Industry Classification System (NAICS) subsector. This data will be evaluated as part of the selection process. New subcontracting plans and SDB participation targets will be required in conjunction with the Phase A Concept Study Reports and will be evaluated as part of the confirmation process.

G. MISSION IMPLEMENTATION INCLUDING ADVANCED DEVELOPMENT

This section must provide a description of the space flight mission through which the investigation is to be executed, including mission design, instrument accommodation, spacecraft, required launch vehicle, ground systems, communications approach (including usage of DSMS infrastructure), and mission operations plan. Specific information should be included that describes the unique requirements placed on these mission elements by the science investigation. In some areas *(e.g.,* instruments), the data requested may already be needed and presented in another section of the proposal (*e.g.,* the Science Implementation section). In such cases, proposers may provide a reference to that (those) section(s) and need not repeat the data in this section.

Within this section, describe the development approach that will ensure mission success. Include the following items to the degree they are known:

- Heritage and maturity of mission elements (instruments, spacecraft, ground systems, and mission design, *etc.*);
- Approach to the use or nonuse of redundancy and other reliability measures;

- Requirements for burn-in of parts and total operating test time required without failure prior to flight;
- Assembly, integration, and test flows and integration and test approach;
- Environmental test philosophy (test flow and sequence, test margins, and test durations);
- Product and mission assurance activities;
- Systems engineering and trade studies (planned and/or completed);
- Potential risks to the proposed mission activities and plans for mitigating those risks;
- Any advanced development plans (new technology) for producing flight qualified hardware/software, including the strategy for bringing advanced development to flight qualification by the end of Phase B and/or backup plans should the advanced development fail to produce adequate maturity for flight;
- Strategy for the management of on-board resources including propellant;
- Planetary protection implementation (forward contamination control and back contamination prevention);
- DSMS infrastructure usage; and
- Other communication and systems parameters enumerated in *NASA's Mission Operations and Communications Services* document (in the DPL)**.**

Although the maturity of the proposed design may require the results of later trades during the Phase A Concept Study, in addition to the information above, the specific data identified below should be provided (preferably in tables) to the extent known at the time the proposal is due and as applicable to the proposed mission configuration.

1. General information.
   - Baseline launch date and launch window;
   - Launch energy (C3) required for baseline launch window;
   - Mission duration (cruise, science, and total);
   - Position and velocity at specified epochs (*e.g.*, before and after maneuvers and critical events) including coordinate system used and assumptions involving force models and/or gravity models affecting the trajectory;
   - Date/Time of orbit insertion;
   - Orbit type (as applicable);
   - Orbit parameters for all science mission phases (semi-major axis, eccentricity, inclination, node time of day, argument of perigee, altitude);
   - Epoch time in Gregorian date and duration of each science mission phase (*e.g.,* different orbits, flybys, *etc.*) corresponding to information above, involving force models and/or gravity models that affect the trajectory;
   - Orbital elements and gravitational parameters of any nonplanetary target (*e.g.,* asteroids, moons, comets); and
   - Earth-Spacecraft Distance (range) for each major event (orbit insertion, flybys, trajectory maneuvers, *etc.*).

2. Downlink Information.
   - Communications System Parameters and other information (see *NASA's Mission Operations and Communications Services* document in the DPL for data required for DSMS and commercial downlink options);
   - Data rate and data volume (kbps or Mbytes per day);
   - Data rate and data volume per day;
   - Bit error rate, onboard storage (Mbytes);
   - Power available for communications (Watts);
   - Number of data dumps per day, spacecraft data destination (*e.g.,* the mission operations center);
   - Science data destination (*e.g.,* a science operations center); and
   - Maximum time lag between data dump and data arrival at destination if relevant to science needs.

3. Uplink Information.
   - Communications Systems parameters and other information requested in the document in the DPL entitled *NASA's Mission Operations and Communications Services*, including data required for DSMS and commercial uplink options;
   - Number of uplinks needed per day;
   - Number of bytes per uplink;
   - Bit error rate; and
   - Approach and schedule for obtaining license(s) for use of proposed frequency bands.

4. Provision of critical event data. Critical events are defined as events that could result in the loss of the mission if anomalies occur (*i.e.*, orbit insertion, entry/descent/landing, *etc.*), and telemetry is required for mission critical events to allow the cause of loss of mission to be determined. The approach and plans for how such data are to be measured and returned must be discussed.

5. Contingencies and Margins. Using the definitions in the table below,
   - Provide estimates of the contingencies and margins for mass, power, and fuels at both the subsystem and system levels for the combined instrument payload and spacecraft; and
   - Provide the contingencies and margins for the requirements on the spacecraft, *e.g.,* pointing accuracy, stability, attitude, and maneuvering, necessary for science operations (include design margins, when known) for the instrument payload alone.

Definitions of Contingency and Margin

Contingency (or *Reserve*), when added to a resource, results in the maximum expected value for that resource. Percent contingency is the value of the contingency divided by the value of the resource less the contingency.

Margin is the difference between the maximum possible value of a resource (the physical limit or the agreed-to limit) and the maximum expected value for a resource. Percent margin for a resource is the available margin divided by its maximum expected value.

Example: A payload in the design phase has a currently estimated mass of 115 kg including a mass reserve of 15 kg. There is no other payload on the Expendable Launch Vehicle (ELV) and the ELV provider plans to allot the full capability of the vehicle, if needed. The ELV capability is 200 kg. The mass reserve is 15/(115-15) = 15%, and the mass margin is 85 kg or 85/115 = 74%.

Example: The end-of-mission life capability of a spacecraft power system is 200 Watts. The proposed instrument is expected to use 40 Watts, and a 25% contingency is planned. If 75 Watts is allotted by the satellite provider, the reserve is (.25x40) =10 Watts while the margin is 75 – (40+10) =25 Watts, or 25/50 = 50%.

Using the term contingency equivalently to the term reserve, and acknowledging that the maximum expected resource value is equal to the maximum proposed resource value (including contingency), the above technical terms can be expressed in equation form as:

$$\text{Contingency} = \text{Max Expected Resource Value} - \text{Proposed Resource Value}$$

$$\%\ \text{Contingency} = \frac{\text{Contingency}}{\text{Max Expected Resource Value} - \text{Contingency}} \times 100$$

$$\text{Margin} = \text{Max Possible Resource Value} - \text{Max Expected Resource Value}$$

$$\%\ \text{Margin} = \frac{\text{Margin}}{\text{Max Expected Resource Value}} \times 100$$

6. Attitude and Control Requirements.

- Control method (3-axis, spinner, gravity gradient, *etc.*; for a spin stabilized spacecraft, provide spin rate and axis in terms of spacecraft body coordinate frame);
- Control reference (solar, inertial, nadir, limb, *etc.*);
- Attitude requirements as a function of time during all science mission phases;
- Attitude control requirements for bias, drift, stability or jitter, and rate for scanning (each axis);
- Spacecraft attitude knowledge requirements at the instrument interface for bias, drift, jitter, and rate for scanning (each axis);
- Agility (maneuvers, scanning, *etc.*);
- Deployments (solar panel, antennas, *etc.*);
- Articulation (1- or 2 -axis solar arrays, antennas, gimbals, *etc.*);
- On-orbit calibration (alignment, line-of-sight, thermal deformation); and
- Attitude knowledge processing (*e.g.,* real-time versus post processing, space-borne versus ground).

7. Instrument Characteristics.

For each science instrument provide the following information:

- Mass (include breakouts of electronics and optics if known);
- Viewing direction in body coordinates;
- Operational modes;
- Operational mode timeline;
- Data demand for each instrument operational mode;
- Onboard recording required from spacecraft;
- Power demand for each instrument operational mode including peak, average, and stand-by power;
- Supplemental power supplied by primary batteries;
- Statement of whether instrument is active or passive;
- Instrument thermal control capability;
- Bias, drift, and noise of instrument data used in pointing control and knowledge determination; and
- Character of significant internally generated jitter and momentum.

8. Spacecraft Characteristics.

To the extent known at the time of proposal submission, and as applicable to the proposed investigation, provide the following information (Note: for Missions of Opportunity (MOs), provide the information below that is related to the proposed investigation's requirements on, and interfaces with, the sponsor's instrument/spacecraft):

- Spacecraft Parameters:
    - A block diagram of the spacecraft subsystem components; and
    - Sensor and actuator information (precision/errors, torque, and momentum storage capabilities, *etc.*).

- Propulsion:
    - Estimated delta-V budget;
    - Propulsion type(s) (monoprop, bi-prop, dual-mode, solar electric, *etc.*) and associated propellant(s)/oxidizer(s);
    - Propellant mixture ratio (if bi-prop); and
    - Specific impulse of each propulsion mode.

- Modes of Communications Operations:
    - For transmit-only mode: Mode timeline, data rate(s), and duration;
    - For receive-only mode: Mode timeline, data rate(s), and duration;
    - Antenna Tx and Rx patterns (if available); and
    - For Rx and Tx modes simultaneously: Mode timeline and duration.

- Command and Data Handling:
    - Spacecraft housekeeping data demand. If known, time-lined data demands shall be provided for each subsystem operational mode, *i.e.*, for Guidance, Navigation, and Communications: standby, fine pointing, and reaction wheel momentum management; and for Communications: transmit, and receive;
    - Data storage unit size (Mbits);
    - Maximum storage record rate; and
    - Maximum storage playback rate.

- Power:
    - Definition of each spacecraft subsystem operational mode over all science phases (Note: provide power demand as well as operational schedule (timeline) for each operational mode);
    - Type of array structure (rigid, flexible, body mounted);
    - Solar array axes of rotation (vector projected in spacecraft coordinates);
    - Array size;
    - Solar cell type and efficiency;
    - Expected power generation at Beginning of Life (BOL) and End of Life (EOL);
    - Worst case Sun incidence angle to solar panels during science mission;
    - Battery type and storage capacity;
    - Worst case battery Depth of Discharge (DOD); and
    - Spacecraft bus voltage.

For the Discovery Mission proposals, a specific portion of the Mission Implementation section (limit of 5 additional pages) may be devoted to the discussion of any proposed new technologies/advanced developments and the approach that will be taken to reduce their associated risks. Within this section, specific topics to be addressed should include:

- Identification and justification of the Technology Readiness Level (TRL) for each proposed new development and/or advanced development at the time the proposal is submitted (Note: see TRL definitions in the DPL);
- Description of the proposed plan for bringing each of the identified items to a minimum of TRL 6, defined as "system/subsystem model or prototype demonstration in a relevant environment, space, or ground" by Confirmation Review (CR) at the end of Phase B (include discussion of simulations, prototyping, systems testing, life testing, *etc.*, as appropriate);
- An estimation of the manpower, cost resources, and the schedule required to complete the above plans; and
- If any fallbacks/alternatives exist and are planned (desirable but not mandatory), a description of the cost, schedule, and performance liens they will impose on the baseline design and the decision milestones for their implementation.

H. MANAGEMENT AND SCHEDULE

This section should summarize the investigator's proposed management approach for the complete investigation including the E/PO. The management organization (including an organization chart) and decision-making process should be described and the teaming arrangement (as known) should be discussed. The responsibilities of team members, including contributors, and institutional commitments should be discussed. Unique capabilities that each team member organization brings to the team, as well as previous experience with similar systems and equipment, should be addressed. If no relevant previous experience is cited, the proposer must, as a minimum, discuss his/her approach to providing the appropriate services and/or capabilities to assure investigation success. The specific roles and responsibilities of the PI and Project Manager (PM) must be described and the PI and PM identified, although other key project personnel need not be identified by name at this time. Risk management and risk mitigation plans (see Section 5.4.4) must be described. This discussion should include identification of the top five perceived risks, descope strategies (if relevant), and management strategies for control, allocation, and release of technical, cost, and schedule reserves and margins. When major subcontracts are required, the acquisition strategy, including contract incentive policies, should be described. If applicable, this section should also include a description of the National Environmental Protection Act (NEPA) and Nuclear Safety Launch Approval requirements for the proposed mission, and a brief description of the implementation plan, including schedule, for satisfying these requirements.

A project schedule to meet the proposed launch date and covering all phases of the investigation should be provided. The schedule should include, as a minimum:

- Proposed major project review dates;
- Instrument development;
- Spacecraft development;
- Instrument-to-spacecraft integration and test;
- Launch vehicle integration;
- Mission operations and data analysis; and
- Planning and implementation of the E/PO program.

The schedule reserve and critical path (*i.e.*, the sequence of major activities and milestones that must be accomplished in the planned sequence and are critical to implementation success) should be clearly identified.

A Level-1 Work Breakdown Structure (WBS) shall be provided as a part of the proposal that clearly links the project organization with the cost information to be provided in Table B-1 and provides the proposer with a template for the project schedule information requested above. Inclusion of additional WBS information (Levels 2 and 3) is encouraged relative to the flight system development (Phases B/C/D) to demonstrate clear understanding of the proposer's implementation plans.

MO proposals should specifically address how the investigation team will interrelate with the sponsor of the parent mission, organizationally and managerially. MO proposals should also address:

- The status of the commitment from the spacecraft builder/owner or sponsoring organization to fly the proposed instrument or conduct the proposed investigation;
- If and how the proposed investigation relates to the spacecraft sponsor's overall mission objectives;
- The investigation development plan and how it fits in the development plan for the sponsor's parent mission;
- How the operations plan for the proposed investigation fits within the parent mission of the sponsoring organization; and
- The investigation's organizational interfaces and plans for reporting to NASA.

I. COST AND COST ESTIMATING METHODOLOGY

This section shall include an estimated cost of the investigation that encompasses all proposed activities, including all applicable mission phases, launch services, development of the ground data system, implementation of E/PO, fees, and contributions. These costs shall be consistent with the requirements described in Sections 5 and 7 of this AO. In particular, where NASA-provided services are used, NASA Civil Service labor and supporting NASA center infrastructure must be costed on a full cost accounting basis (see Section 5.9.2). The amount of funding required in each Fiscal Year (FY) should be identified by providing the data requested in Tables B-1 and B-2 for Discovery investigations; MO investigations should utilize only those lines in the tables that are

applicable. The top portion of Table B-1 requests cost data relative to the NASA OSS Cost while the bottom portion requests cost data relative to Contributions. Table B-2 summarizes the NASA OSS Cost by phase. The completed tables will not be counted against the page limit. Table B-3 gives the NASA inflation index to be used to calculate real year dollars. Proposers must submit the requested data in formats shown in Tables B-1 and B-2.

The methodology used to estimate the cost *(e.g.,* grass roots estimates, vendor quotes, specific cost models, past performance, and/or cost estimating relationships from analogous missions) should be discussed. Budget reserve strategy, including budget reserve levels as a function of mission phase, should be discussed. All assumptions used in developing cost estimates should be provided to help facilitate reviewer understanding of the proposed cost.

J. APPENDICES

The following additional information is required to be supplied with the proposal as Appendices unless otherwise specified, and as such, will not be counted within the specified page limit. NO OTHER APPENDICES ARE PERMITTED.

1. Statement of Work (SOW) and Funding Information. A SOW is required regardless of whether the proposal is submitted from a non-Government or a Government institution. This SOW must include the requirement for a Phase A Concept Study report that is described in the *Guidelines and Criteria for the Phase A Concept Study* document available in the DPL. This SOW must include general tasks statements for Phases B/C/D and for Phase E for Discovery Mission investigations and MO investigations. All SOWs should include the following as a minimum: Scope of Work, Deliverables (including science data), and Government Responsibilities (as applicable). SOWs need not be more than a few pages in length. If more than one contractual arrangement between NASA and the proposing team is required, funding information must be provided that identifies how funds are to be allocated among the organizations, including a separate SOW for each organization.

2. Letters of Endorsement. Letters of endorsement must be provided from all U.S. and non-U.S. organizations offering critical facilities (*e.g.,* integration and test, thermal vacuum chambers, L-Tool, *etc.*), goods, hardware, software, and/or services (including those of Co-Investigators). These letters must provide evidence that the senior officials of the participating institutions and/or appropriate Government officials are aware and supportive of the proposed investigation, and will provide funding for their stated participation in the investigation if it is selected by NASA, and must be signed by officials authorized to commit those organizations as proposed. Failure to provide such Letters of Endorsement from all parties involved in the proposal can be reason for declaring the proposal noncompliant and returned without review.

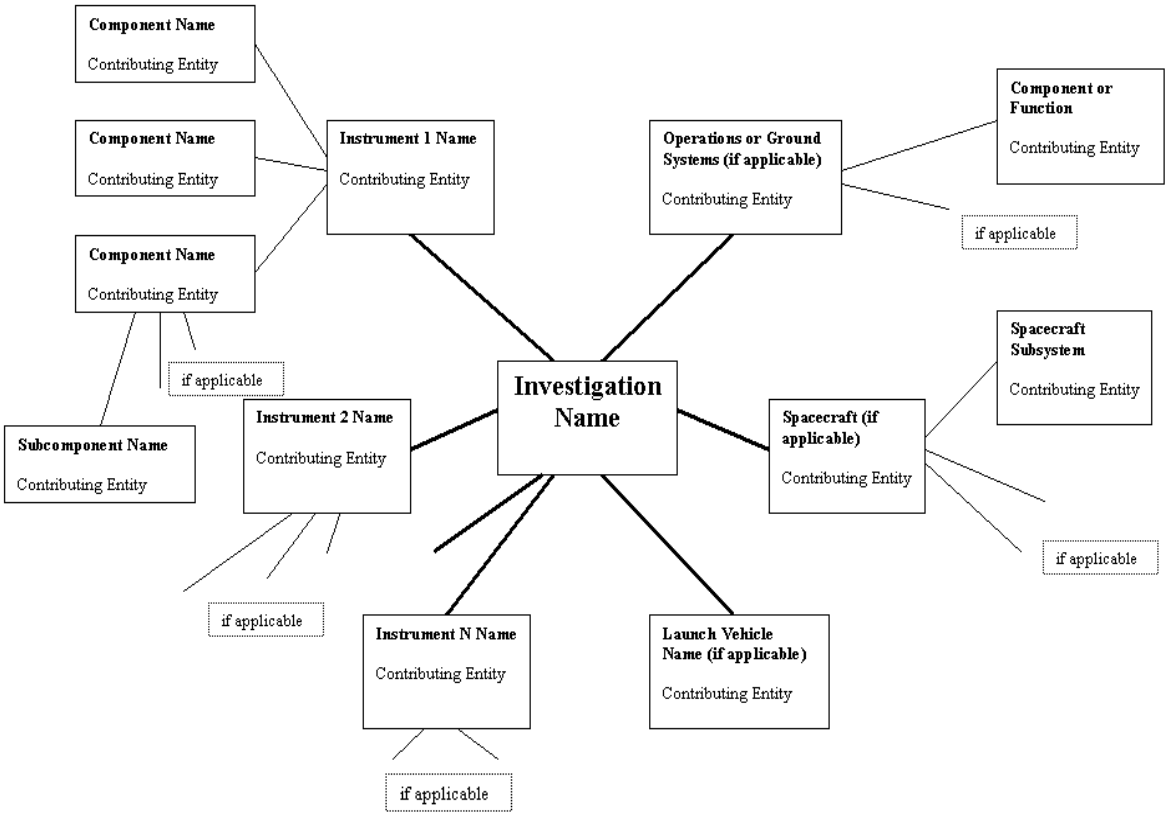
3. Summary of Proposed Program Cooperative Contributions. The following requirement for additional information does not apply to Missions of Opportunity proposed in response to this AO. As provided in section 7.2.4 of the AO, each proposal will be evaluated for feasibility of the proposed approach for implementation, including cost risk. Per these provisions, proposals that include cooperative contributions, whether foreign or domestic, may be attributed risk if (1) the approach does not have clear and simple technical and management interfaces, (2) the proposal does not provide evidence that the contribution is within the scientific and technical capability of the contributing partner, and/or (3) the proposal does not include a firm commitment for each contribution. Cooperative contributions are defined to be those that are to be provided to the proposed investigation from a domestic or international partner on a no-exchange-of-funds basis. In order to aid NASA in conducting an equitable assessment of risks from cooperative contributions, each proposer must provide, in addition to the commitment letter from funding sponsors of all cooperative contributions, two additional items:

    a. An "exploded diagram" of the mission (see example figure) that provides a clear visual representation of cooperative contributions incorporated in the proposed implementation approach. All cooperative contributions, including those that will require an international agreement, or inter-agency memorandum of agreement, must be shown in this diagram. Each contribution shown must display a unique name for the contribution as well as the identity of the contributing entity. However, the following should not be shown:
        i. If there are no cooperative contributions of spacecraft, launch vehicle or services, or ground operations or facilities, these boxes need not be shown on the diagram at all.
        ii. Scientific collaborations such as joint data analysis that do not involve contribution of flight hardware or other critical items should not be shown.
        iii. Foreign or domestic goods and services obtained by contract using NASA funds are not cooperative contributions and are also not to be shown.

    b. A supporting table with more information that elaborates each cooperative contribution shown in the exploded diagram.
    The table must include, for each contribution, the following information:
        i. Unique name identifying the contribution (matching the name on the exploded diagram);
        ii. The identity of the providing entity, whether foreign or domestic;
        iii. For foreign contributions, the identification of the funding sponsor if different from the entity identified in item (ii) above; and

iv. The approximate value of the contribution, in U.S. dollars (i.e., what would be the cost to NASA to replace the contribution if it were not provided as planned).

Sample "Exploded Diagram"



4. Resumes. Provide resumes for all science team members (PI and Co-Is) identified in the science section, for all key project personnel who are identified by name in the proposal, and for all key E/PO personnel. Each resume should contain the following information in the following order:
   a) The name and employing organization of the individual;
   b) A one or two sentence description of the individual's job or role on the proposed investigation;
   c) A resume that clearly shows the experience related to the responsibilities that the individual will perform for the proposed investigation, including (as appropriate) the analysis and publication of final science results;
   d) The commitment signature of the individual and date (waived if a Letter of Commitment is provided and signed by the individual); and
   e) If any portion of the commitment is by way of a contribution to the proposed investigation *(i.e.,* not to be supported by NASA through the proposal), the amount of the contribution in terms of approximate number of Full Time Equivalent (FTE) work years over the nominal duration of

the proposed project (*i.e*., through Phase E) and the signature of an authorizing official of the individual's organization.

The complete resume forms may be no longer than two pages for each participant and should be organized alphabetically after that of the PI.

5. Discussion of Compliance with U.S. Export Laws and Regulations. Investigations that include international participation, either through involvement of non-U.S. nationals and/or involvement of non-U.S. entities must include a section discussing compliance with U.S. export laws and regulations; *e.g.,* 22 CFR 120-130, *et seq*. and 15 CFR 730-774, *et seq*., as applicable to the scenario surrounding the particular international participation. The discussion must describe the proposed international participation in detail and include, but not be limited to, whether or not the international participation may require the proposer to obtain the prior approval of the Department of State or the Department of Commerce via a technical assistance agreement or an export license, or whether a license exemption/exception may apply. If prior approvals via licenses are necessary, discuss whether the license has been applied for, or if not, the projected timing of the application and any implications for the schedule. Information regarding U.S. export regulations is available at http://www.pmdtc.org and http://www.bis.doc.gov. Proposers are advised that under U.S. law and regulation, spacecraft and their specifically designed, modified, or configured systems, components, parts, *etc.*, such as the instrumentation being sought under this AO are generally considered "Defense Articles" on the U.S. Munitions List and, therefore, subject to the provisions of the International Traffic in Arms Regulations, 22 CFR 120-130, *et seq*. (see AO Section 5.10).

6. Outline of Technical Responsibilities Between U.S. and International Partners. These outlines will be used by the Office of External Relations, NASA Headquarters, as the starting point for formalizing the agency-to-agency agreements that will be required if the investigation is selected (see AO Section 5.10).

7. Compliance with Planetary Protection Requirements. NASA's Planetary Protection Policy (see NPD 8020.7F and NPR 8020.12B located in the DPL) imposes certain restrictions on mission operations and spacecraft cleanliness depending on the particular type of mission (orbiter vs. lander/life-detection vs. no life detection) and the specific environments to be visited. The proposal should indicate: (i) the anticipated planetary protection category of the mission under NASA directives; (ii) the proposed mission operational accommodations to comply with the anticipated requirement; and (iii) the proposed steps to be taken for the preparation of the orbital and (if any) landed portions of the spacecraft to comply with the requirements for overall microbiological cleanliness and recontamination prevention prior to launch. If necessary, the proposal should also indicate the nature of the proposed implementation of back-contamination control

and subsequent containment and testing of returned samples, or the proposed rationale for the mission to be relieved from the containment requirement. Proposals should address the organization(s) responsible for implementing those steps.

8. Compliance with Procurement Regulations by NASA PI Proposals. Proposals submitted by NASA employees as PIs should contain the following information concerning the process by which non-Government participants were included in the proposal. The proposal should: (i) indicate that the supplies or services of the proposed non-Government participant(s) are available under an existing NASA contract; (ii) make it clear that the capabilities, products, or services of these participant(s) are sufficiently unique to justify a sole source acquisition; or (iii) describe the open process that was used for selecting proposed team members. While a formal solicitation is not required, the process cited in (iii) above should include at least the following competitive aspects: notice of the opportunity to participate to potential sources, submissions from and/or discussions with potential sources, and objective criteria for selecting team members among interested sources. The proposal should address how the selection of the proposed team members followed the objective criteria and is reasonable from both a technical and cost standpoint. The proposal should also include a representation that the PI has examined his/her financial interests in or concerning the proposed team members and has determined that no personal conflict of interest exists. The proposal must provide a certification by a NASA official superior to the PI verifying the process for selecting contractors as proposed team members, including the absence of conflicts of interest.

   If a proposed team member will perform a substantial portion of the science investigation, selection of the NASA PI's proposal under this AO satisfies competition requirements for the team member's proposal including any hardware or routine support service to be provided by the team member. If a non-Government participant is only providing hardware or routine support services, a separate competition must take place or a noncompetitive procurement approved according to regulations.

9. Acronyms and Abbreviations. A reference acronym list is provided in the DPL.

10. References. As an option, the proposal may provide a list of reference documents and materials used in its preparation. These documents and materials themselves may not be submitted except as a part of the proposal and included within the prescribed page count, nor should it be necessary to consult them to adequately review the proposal.

TABLE B-1
TOTAL MISSION COST FUNDING PROFILE
FY Costs in Real Year Dollars (to nearest thousand), Totals in RY and Fixed Year '04 Dollars

			SUBTOTAL					SUBTOTAL		TOTAL	
	Formulation		***Formulation****		*Implementation*			***Implementation****		***LIFE CYCLE***	
Cost Element **	FY1	FYx	RY $	FY03$	FY1	…	FYz	RY $	FY03$	RY $	FY03$
Start to Launch + 30 Days (Phases A/B/C/D)	**Enter each cost element**										
Phase A Concept Study											
Proj. Mgmt/Miss. Analysis/Sys. Eng.											
Instrument A											
Instrument B											
Instrument …											
Instr. Integration, Assembly and Test											
Subtotal - Instruments											
Spacecraft bus											
S/C Integration, Assembly and Test											
Other Hardware Elements (1)											
Launch Ops (Launch +30 days)											
Subtotal - Spacecraft											
Science Team Support											
Pre-Launch GDS/MOS Development											
DSN/Tracking											
Other (2)											
Subtotal Phases A-D before Reserves											
Instrument Reserves											
Spacecraft Reserves											
Other Reserves											
Total Phases A/B/C/D											
Launch + 30 Days to End of Mission (Phase E)	**Enter each cost element**										
Mission Operations & Data Analysis (including Project Management)											
DSN/Tracking											
Other (2)											
Subtotal Phase E before Reserves											
Reserves											
Total Phase E											
Launch Services											
RPS(s)											
Total NASA Phase A-E											
Phase F (Extended Mission if Applicable)											
PSP											
DAP											
Total NASA Cost											
Contributions (2)											
Total Contributions											
Total Mission Cost = →											

(1) Other Hardware Elements: Probes, Sample Return Canister, Etc.

(2) Specify each item on a separate line; include Education & Public Outreach, Tech Infusion/Transfer, facilities, etc.

* Note: Formulation = Phase A + B; Implementation = Phase C + D + E

** See ***Cost Elements*** document in the Discovery Program Library

TABLE B-2

MISSION PHASE SUMMARY OF NASA OSS COST

FY Costs in Real Year Dollars (to nearest thousand); Totals in RY and FY2004 Dollars

Cost Element	**FY1**	**FY2**	**FY3**	**FYn**	**RY$**	**FY04$**
Phase A						
Phase B						
Phases C and D						
Phase E						
Launch Vehicle/Launch Services						
Total OSS Mission Cost						
Contributions						
Total Mission Cost						

TABLE B-3

NASA NEW START INFLATION INDEX

Fiscal Year	2004	2005	2006	2007	2008	2009	2010
Inflation Rate	0%	1.9%	2.0%	2.1%	2.1%	2.0%	2.0%
Cumulative Inflation Index	1.0	1.019	1.040	1.062	1.094	1.106	1.129

Use an inflation rate of 2.0% for years beyond 2010.

APPENDIX C

REGULATIONS GOVERNING PROCUREMENT OF FOREIGN GOODS OR SERVICES

The following Federal Acquisition Regulation (FAR) clauses cover the purchase of foreign goods and services and may be included in contracts resulting from this Announcement of Opportunity:

52.225-1 Buy American Act -- Supplies (May 2002)

52.225-8 Duty-Free Entry (February 2000)

52.225-13 Restrictions on Certain Foreign Purchases (July 2000)

52.225-15 Sanctioned European Union Country End Products (February 2000)

52.225-16 Sanctioned European Union Country Services (February 2000)

Note that additional Federal Acquisition Regulation (FAR) and NASA FAR Supplement clauses may be applicable to specific procurement actions as required by the cognizant Contracting Officer.

The proposer is directed to the Federal Acquisition Regulations and the NASA FAR Supplements for further information on these regulations. Access information for these documents is given in the Discovery Program Library (see Appendix D).

APPENDIX D

DISCOVERY PROGRAM LIBRARY

The Discovery Program Library (DPL) includes documents available electronically via the Internet; many documents are also available as a paper copy from their original source. Note that not all documents are actually located in the DPL. For these documents, an Internet hyperlink has been provided via the DPL to allow download of the documents from their home location.

It is incumbent upon the proposer to ensure that the documents used in proposal preparation are of the date and/or revision listed in this Announcement of Opportunity (AO).

The DPL is accessible on the World Wide Web at the URL:

http://discovery.larc.nasa.gov/discovery/DPL.html

NASA and Office of Space Science (OSS) Strategies and Policies

NASA 2003 Strategic Plan (February 2003)
Describes strategy and goals for achieving NASA's mission and vision.

The Space Science Enterprise Strategic Plan (October 2003)
Describes the goals and outlook of NASA's Space Science Enterprise, and of the major ideas described in the context of the overall NASA Strategic Plan.

Solar System Exploration
Web site describing NASA's Solar System exploration programs and missions.

Roadmap for the Office of Space Science Solar System Exploration Division (March 2003)
Describes OSS strategy and plans for exploring the Solar System.

Roadmap for the Office of Space Science Origins Theme (February 2003)
Describes OSS strategy and plans for the Astronomical Search for Origins.

The Space Science Enterprise Integrated Technology Strategy (October 1998)
Describes efforts to manage technology infusion into future OSS (OSS) missions and to promote technology transfer to the private sector.

The Education Enterprise Strategic Plan (November 2003)
Describes the goals and objectives of NASA's Education Enterprise in the overall context of the NASA Strategic Plan.

National Research Council (NRC) Documents

NRC Planetary Science Decadal Survey (July 2002)
Presents NRC decadal recommendations for Solar System exploration.

NRC Committee on Planetary and Lunar Exploration: Exploring the Trans-Neptunian Solar System (1998)
Presents NRC recommendations for the exploration of the Trans-Neptunian Solar System.

NRC Committee for Planetary and Lunar Exploration (COMPLEX) Report (November 2001)
Presents COMPLEX's assessment of planetary exploration science and priorities.

Discovery Program Background

Discovery Program Commitment Agreement *(March 2003)*
This document is the highest level definition of the Discovery Program, being the commitment the Associate Administrator for Space Science has with the NASA Administrator. This agreement is updated annually.

Discovery Program Plan *(October 1999)*
Provides the objectives and performance goals, the program-level requirements and interfaces, and the management structure and authority for the overall Discovery Program. It is the commitment between the Discovery Program Manager and the Associate Administrator for Space Sciences.

Discovery Management Workshop Reports
Includes "*Final Report of the Discovery Management Workshop"* and *Recommendations for Discovery Policy and Implementation Guidelines,* two documents generated by the April 1993 Discovery Management Workshop which was convened to address issues in the management of individual Discovery missions and of the Discovery Program as a whole.

Discovery Program Lessons Learned Archive (March 2004)

Summarizes the lessons learned and shared in the Discovery Program Lessons Learned Workshops and Retreats.
(URL: http://discovery.larc.nasa.gov/discovery/lessonslearned.html)

Contour Mishap Investigation Board Findings (October 2003)

Lessons learned from Contour, the fifth Discovery mission.

Discovery Guidelines and Requirements Documents

NASA's Mission Operations and Communications Services (May 2003)

Describes the functions and costs of Ground Data Systems and Mission Operations and Data Analysis available via NASA.

Discovery Launch Services Information Summary (December 2003)

Describes capabilities and costs of launch services that are available to launch Discovery spacecraft selected pursuant to this AO.

Navigation and Ancillary Information Facility Services for Discovery Missions (August 2003)

Describes the NASA Ancillary Information Facility and the Spacecraft Planet Instrument C-matrix Events (SPICE) capability for mission design, mission planning, observation planning, and interpretation of scientific observations.

Specifications for Space Radioisotope Heating Units (RHUs) for Discovery

A series of documents describing the technical specifications for utilizing RHU options on Discovery missions.

In-Space Propulsion (ISP) (November 2002)

Describes the technical specifications for utilizing ISP on Discovery missions.

NASA Astromaterials Curatorial Facility (February 2004)

Provides guidelines specific to sample return mission proposals for use of the NASA Astromaterials Curatorial Facility.

Guidelines and Criteria for the Phase A Concept Study (February 2003)

Provides proposers who are selected via the AO with guidelines and criteria for preparation of the Concept Study Report.

Cost Element Definitions (February 2004)

Provides definitions for the major cost elements for proposals.

Technology Readiness Levels (TRLs) Definitions (2001)

Provides definitions of TRLs.

Announcement of Opportunity Acronym List (March 2004)

Provides a list of acronyms used in this AO.

Office of Space Science Education and Public Outreach (E/PO) Documents

Office of Space Science Education and Public Outreach Annual Reports

Describe the breadth of OSS Education and Public Outreach (E/PO) programs and accomplishments.

Explanatory Guide to the Office of Space Science Education and Public Outreach Evaluation Criteria (March 2004)

Answers frequently asked questions, and elaborates on each of the OSS E/PO criteria.

Implementing the Office of Space Science Education and Public Outreach Strategy: A Critical Evaluation at the Six-Year Mark (March 2003)

Describes OSS's overall approach to implementing its E/PO strategy.

Partners in Education: A Strategy for Integrating Education and Public Outreach into NASA's Space Science Programs (March 1995)

Describes the overall strategy for integrating E/PO into NASA's s Space Science programs.

Office of Space Science Education and Public Outreach Newsletters

Describe OSS E/PO newsworthy activities.

General Guidelines and Requirements Documents

Example Mission Definition and Requirements Agreement

Provides an example of a mission definition and requirements agreement between principal organizations for supporting an OSS mission.

NPR 7120.5B NASA Program and Project Management Processes and Requirements (November 2002)

Provides information on typical activities, milestones, and products in the development and execution of NASA missions.

NPD 8730.4 Software Independent Verification and Validation (IV&V) Policy (August 2001)

Provides information on the NASA IV&V policy.

NPD 8610.7 Launch Services Risk Mitigation Policy for NASA-Owned or NASA-Sponsored Payloads (February 1999)

Provides information on NASA's launch services mitigation policy.

NPR 7100.10D Curation of Extraterrestrial Materials (February 2003)

Provides information on the curation of extraterrestrial materials via NASA's Curatorial Facility at JSC.

Planetary Data System (PDS) (April 2002)

Web site describing the basic formats and requirements used for the archiving of planetary data products by the NASA PDS.

Planetary Protection Requirements

A series of documents describing Planetary Protection Requirements for NASA spacecraft missions; includes NPD 8020.7F and NPR 8020.12B.

ISO 9000 Series

The following ISO 9000 quality documents describe current national and NASA standards of quality processes and procedures:

ISO 9000:2000, *Quality Management Systems – Fundamentals and Vocabulary*

ISO 9001:2000, *Quality Management Systems – Requirements*

ISO 9004:2000, *Quality Management Systems – Guidelines for Performance Improvements*

Note: These ISO 9000-related documents are copyrighted and cannot be reproduced without appropriate compensation. For copies contact:

American Society for Quality (ASQ)
P.O. Box 3005
Milwaukee, WI 53201-3005
U.S.A.
Tel.: (800) 248-1946
URL: http://www.asq.org/

For background on NASA ISO policy and the status of its implementation, visit http://iso9000.nasa.gov/.

NASA Technology Transfer Resources

Web site providing an integrated information resource for NASA technology transfer and commercialization.

Directives and Procurement-Related Information

NASA Online Directives Information System (NODIS) Library

Provides online access to NASA Policy Directives (NPDs – formerly NMIs), NASA Procedural Requirements (NPRs – formerly NPGs and NHBs), and NASA Policy Charters (NPCs)

Federal Acquisition Regulations (FAR) General Services Administration

(URL: http://www.arnet.gov/far/)

NASA FAR Supplement Regulations

(URL: http://www.hq.nasa.gov/office/procurement/regs/nfstoc.htm)

NASA Financial Management Manual

(URL: http://www.hq.nasa.gov/fmm/)

NPR 5800.1D -- Grant and Cooperative Agreement Handbook (March 2003)

(URL: http://ec.msfc.nasa.gov/hq/grcover.htm)

Council on Environmental Quality Regulations, 40 CFR Parts 1500-1508

(URL: http://www.access.gpo.gov/nara/cfr/waisidx_02/40cfrv28_02.html)

Code of Federal Regulations

(URL: http://www.access.gpo.gov/nara/cfr/index.html)

Final Environmental Assessment of NASA Routine Payloads on Expendable Launch Vehicles from Cape Canaveral Air Force Station Florida and Vandenberg Air Force Base California (June 2002)

Finding of No Significant Impact (FONSI) (June 2002)

APPENDIX E

CERTIFICATIONS

The text of the following documents are included for reference only. Submission of the signed printout of web page as directed for the Cover Page/Proposal Summary certifies compliance with these certifications.

1. Certification of Compliance with the NASA Regulations Pursuant to Nondiscrimination in Federally Assisted Programs

The *(Institution, corporation, firm, or other organization on whose behalf this assurance is signed, hereinafter called "Applicant ")* hereby agrees that it will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352), Title IX of the Education Amendments of 1962 (20 U.S.C. 1680 et seq.), Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and the Age Discrimination Act of 1975 (42 U.S.C. 16101 et seq.), and all requirements imposed by or pursuant to the Regulation of the National Aeronautics and Space Administration (14 CFR Part 1250) (hereinafter called "NASA") issued pursuant to these laws, to the end that in accordance with these laws and regulations, no person in the U.S. shall, on the basis of race, color, national origin, sex, handicapped condition, or age be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Applicant receives federal financial assistance from NASA; and hereby give assurance that it will immediately take any measure necessary to effectuate this agreement.

If any real property or structure thereon is provided or improved with the aid of federal financial assistance extended to the Applicant by NASA, this assurance shall obligate the Applicant, or in the case of any transfer of such property, any transferee, for the period during which the real property or structure is used for a purpose for which the federal financial assistance is extended or for another purpose involving the provision of similar services or benefits. If any personal property is so provided, this assurance shall obligate the Applicant for the period during which the federal financial assistance is extended to it by NASA.

This assurance is given in consideration of and for the purpose of obtaining any and all federal grants, loans, contracts, property, discounts, or other federal financial assistance extended after the date hereof to the Applicant by NASA, including installment payments after such date on account of applications for federal financial assistance which were approved before such date. The Applicant recognized and agrees that such federal financial assistance will be extended in reliance on the representations and agreements made in this assurance, and that the United States shall have the right to seek judicial enforcement of this assurance. This assurance is binding on the Applicant, its successors, transferees, and assignees, and the person or persons whose signatures appear below are authorized to sign on behalf of the Applicant.

2. Certification Regarding Debarment, Suspension, and Other Responsibility Matters (Primary Covered Transaction)

This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 14 CFR Part 1265.

A. The applicant certifies that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) Have not within a three-year period preceding this application been convicted or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or Local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State, or Local) with commission of any of the offenses enumerated in paragraph A.(b) of this certification;

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or Local) terminated for cause or default; and

B. Where the applicant is unable to certify to any of the statements in this certification, he or she shall attach an explanation to this application.

C. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion -- Lowered Tier Covered Transactions (Subgrants or Subcontracts)

(a) The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any federal department of agency.

(b) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

3. Certification Regarding Lobbying

As required by Section 1352 Title 31 of the U.S. Code for persons entering into a grant or cooperative agreement over $100,000, the applicant certifies that:

(a) No Federal appropriated funds have been paid or will be paid by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, in connection with making of any Federal grant, the entering into of any cooperative, and the extension, continuation, renewal, amendment, or modification of any Federal grant or cooperative agreement;

(b) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting an officer or employee of any agency, Member of Congress, or an employee of a Member of Congress in connection with this Federal grant or cooperative agreement, the undersigned shall complete Standard Form -- LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(c) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subgrants, contracts under grants and cooperative agreements, and subcontracts), and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by S1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

APPENDIX F

DISCOVERY PROGRAM PLANNING BUDGET PROFILE

The Discovery Program funding profile for future missions is subject to a wide variety of pressures. For planning purposes, the five-year forecast of NASA OSS funding for a new mission is provided in the table below (in Real Year Million Dollars). These levels represent the projected highest level of available funding for the years FY 2005-2009, but unused portions of funds in each of these years can be used in the following year(s) if necessary. In addition, these levels represent the total available for selections made through this AO for all costs to NASA OSS, including launch vehicle costs and Deep Space Mission System (DSMS) services as provided in Discovery Launch Services Information Summary, and NASA's Mission Operations and Communications Services documents located in the Discovery Program Library as listed in Appendix D.

	FY 2005	**FY 2006**	**FY 2007**	**FY 2008**	**FY 2009**
Total ($M)	**$4**	**$35**	**$85**	**$100**	**$90**

The NASA forecast for specific budgets beyond FY 2009 are not yet available. Future budgets are expected to be sufficient to cover any funding requirements necessary for missions proposed to this AO that are compliant with the stated cost cap. Discovery missions do not need to consider annual funding limitations for FY 2010 and beyond.

APPENDIX G

PROPOSAL CHECKLIST

The following proposal checklist will be used by NASA to accomplish the compliance check on all proposals received in response to this AO.

Administrative	
1. Proposal delivered on time	§8.0
2. Proposal included copy of electronic cover page and summary	§6.3.2
3. Original PI signature included	§6.3.2
4. Original authorizing official signatures included	§6.3.2
5. Correct number of copies	§6.3.3
6. Meets page limits	Appendix B
7. Includes CD with every copy	§6.3.3
8. Meets general guidelines (one volume original easy to disassemble, no more than 5 fold out pages, one inch margins, maximum 15 characters/inch --approximately 12 pt font)	Appendix B
9. Required appendices included, and no additional appendices	Appendix B
10. Budgets submitted in required formats	Appendix B
11. Letters of endorsement from all organizations contributing critical goods and services including Co-Is, from all major participants, and from any required funding organizations	§5.9.3, §6.3.2, Appendix B
12. Letters of endorsement from participating non-U.S. institutions	§5.10, §8.0, Appendix B
Scientific	
13. Addresses Solar System Exploration or extrasolar planet search priorities as addressed in the NASA 2003 Strategic Plan	§2.1
14. Appropriate data archiving plan	§5.2.4, §5.12.5
15. For full mission investigation, defines both a Baseline mission and a minimum Performance Floor science mission	§5.11.3

Technical	
16. Complete investigation (Phases A-E) for full mission, or allowed type of Mission of Opportunity	§1.1, §5.11.4
17. Team led by a single PI	§5.4.1
18. PM identified by name	§5.4.2
19. Proposed budget within cost cap	§1.1, §5.11.5, §5.11.6, §5.12.7
20. Contributions within contribution limit	§5.9.3
21. Launch services included within the cost cap or contributed	§1.1, §5.3.2, §5.11.2
22. Phase A costs within cost limit	§5.11.7, §5.12.7
23. Cost reserve through the end of Phase B of at least 25 percent of all costs through the end of Phase D except ELV	§1.1, §5.9.1
24. Launch date no later than December 31, 2009	§1.1, §5.11.4,
25. MO commitment needed before December 31, 2005 (if applicable)	§5.12.8
26. Includes E/PO and SDB commitments	§5.6, §5.8